L O C A L A N A L G E S I A

IN THE

OPERATION

OF

LOWER SEGMENT CAESAREAN SECTION

WITH A

CRITICAL SURVEY

OF

OTHER METHODS OF ANAESTHESIA

- BY -

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C O N T E N T S

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Be ye doers of the word, and not hearers only deceiving your own selves.
For if any be a hearer of the word, and not a doer, he is like unto a man beholding his natural face in a glass.
For he beholdeth himself, and goeth his way, and straightway forgetteth what manner of man he was.

James, 1. Ch. 5. V. 22,23,24.

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A

BRIEF HISTORY

OF

LOWER SEGMENT CAESAREAN SECTION.

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Early in the nineteenth century, Friedrich Osiander conceived the operation of lower segment Caesarean Section. Since then, many workers in the fields of surgery, bacteriology and anaesthesia have played their parts in raising this operation, in which the maternal mortality was almost inevitable, to the realm of a therapeutic procedure and life-saving measure.

Infection of the peritoneal cavity was the greatest set-back with which the pioneers were faced. In spite of the introduction of antisepsis and the advance of aseptic technique, this remained so devastating that the operation was still resorted to only as a desperate necessity in those cases in which the life of the baby was put before all else. The impossibility of rendering the genital tract and uterus sterile was long recognised as the cause of this state of affairs, and the problem could not be solved until closure of the uterine wound and its sealing-off from the peritoneal cavity were perfected.

Necessity, then, gave rise to the extraperitoneal route and in 1821 Ferdinand Ritgen performed the first operation of "Gastro-elytrotomy". Two years later Baudelocque performed two somewhat similar operations, but in all three cases the women died. It was not till 1870 that this operation was attempted again when T.G. Thomas, Professor

of Obstetrics in the College of Physicians & Surgeons of New York, had occasion to use it. In one case both mother and child survived. Whiteside Hime of Sheffield was the first to perform the operation in England, in 1878.

According to Macintosh Marshall, within the ten years 1870 - 1880, eight gastro-elytrotomies were performed - six in America and two in England - with a maternal mortality of 50 per cent. Owing to the greater difficulty of controlling haemorrhage, the operation fell into disrepute in favour of the older 'classical' procedure.

The use of chloroform and ether was becoming widespread by the end of 1847, and in 1867 Lister's Carbolic sterilisation was being accepted. With the recognition of the work of Robert Koch and Pasteur, the danger of infection from without was being overcome, but the problem still remained, how to protect the peritoneal cavity from infected lochia. Porro of Pravia, in 1876, offered a temporary but drastic solution. He reported a case in which, because of sudden haemorrhage he had performed a sub-total hysterectomy and had fixed the stump of the cervix in the abdominal wound.

Kehrer and Sänger, in 1881 and 1882, stressed that the danger of infection lay in the non-closure or hitherto imperfect attempts at closure of the uterine wound. Kehrer's description of his first Caesarean Section differs

little from the procedure adopted by modern operators over forty years later, (Munro Kerr, Hendry et al.) In fact this is the first clear description of the intra-peritoneal lower segment approach with separate suture of the uterus and overlying peritoneum.

In succeeding years, many different uterine incisions were practised, and the lower segment appeared to be forgotten. Between 1890 and 1900 the operative mortality had fallen to five per cent in a few clinics. However, the absence of pre-existing infection remained the determining factor in success, death ensuing chiefly from peritonitis; and, although several series were reported with a mortality of as low as one percent, it is clear that none of these cases was 'suspect' or 'infected'.

The next step back to the lower segment operation was initiated by Frank of Köln who, in 1906, reported his "supra-symphysial" operation in the course of which he sutured the visceral to the parietal peritoneum before incising the lower segment. Later, Sellheim appreciated the benefit of making the incision as low as possible in the cervix or isthmus. By 1912 the lower segment operation was fully established and yielded very satisfactory results in many hands.

It is now more than thirty years since Munro Kerr, who is often described as the 'Father of the lower-segment

section', introduced the operation into this country. Later, together with Hendry, he continued to stress its many advantages, and to-day it is widely used in all leading hospitals.

In 1937 in a survey of 1263 operations performed in nine different hospitals in Britain, the maternal mortality (unreduced) was 1.42 per cent.

De Lee furnished the following figures demonstrating the decrease in maternal mortality after the lower segment operation:-

Chicago Lying-In Hospital
1914 to 1936

Type of Operation.	Cases.	Deaths.	Percentage.
Classical.	168	11	6
Lower segment.	1875	18	0.96

City of Chicago

Type of Operation.	Cases.	Deaths.	Percentage.
Classical.	400	27	5.5
Lower segment.	541	11	2.0

Since the introduction of sulphonamides the mortality has been further lowered. This fact is borne out by the following table which is an analysis of all types of

Caesarean Section performed at the Boston Lying-In Hospital between 1934 and 1943:-

	1934-1943	1934-1938	1939-1943
No. of Cases	1,887	-	-
Mat.Mortality	1.3%	1.9%	0.7%

In a series of 563 cases of Caesarean Section performed between the years 1943 to 1948 at Hillingdon County Hospital, Middlesex, there were five deaths, giving a mortality rate of 0.89 per cent. Of these five deaths, three occurred in 1943 and were due to sepsis. After the introduction of penicillin there were no further deaths from sepsis in this series.(1)

Operative technique and asepsis have reached a high degree of perfection, and yet we cannot say that the operation is completely safe. Even if further advances in these two lines are outside our reach, there yet remains the comparatively neglected aspect of anaesthesia in Caesarean Section. It is with this aspect that this paper deals.

A BRIEF HISTORY OF ANAESTHESIA

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The earliest record of anaesthesia is to be found in Genesis II, verse 21, "and the Lord God caused a deep sleep to fall upon Adam and he slept; and He took one of his ribs, and closed up the flesh thereof".

HYPNOTISM

Hypnotism, in one form or another, is as old as the human race. It was known to the Chaldeans, the Babylonians, the Egyptians, the Persians, the Hindus, the Greeks, the Romans and other ancient peoples. It was practised in the Temples by the priests to treat both mental and physical disease. The man who gave it to the people and divorced it from its ecclesiastical place was Franz Anton Mesmer during the late eighteenth century. James Braid of Edinburgh 1795-1860, invented the word hypnotism, saying that mesmerism was subjective and not objective as Mesmer had implied. Braid became interested when the Frenchman, Charles Lafontaine, gave a demonstration in midwifery mesmerism at Manchester Lying-in Hospital.

Gould and Pyle quote a case from the Boston Medical and Surgical Journal[2] in which a woman was delivered of a son while in a state of artificial somnambulism.

Writing in the twelfth century on the life of Saint Kentigern, Patron Saint of Glasgow, 518 - 603 A.D., Joceline, a Furness monk, appears to have had a perfect knowledge of anaesthesia. He first describes how the Mother of the Saint was impregnated without her knowledge

having become the prey of some unscrupulous hypnotist. Later he mentions that St. Kentigern himself abstained from wine and all that inebriates.(3)

Psychological anaesthesia need not imply unconsciousness. It is stated in Theocritus:(4) "for then the daughter of Antigone, weighed down with throes, called out for Lucina, the friend of women in travail, and she with kind favour stood by her, and in sooth poured down her whole limbs an insensibility to pain, and so a lively boy like his father was born".

DRUGS

One of the most ancient drugs used in anaesthesia was the poppy. As far back as the reign of the Emperor Claudius, Scribonius describes how to slit the capsule, dry the juice and roll it into a ball. This remains the modern method of preparing commercial opium.

In the middle of the sixteenth century Paracelsus isolated laudanum, and in 1816 Sertürner isolated morphine. With the advent of the hypodermic syringe, scientific dosage was begun. Opium obeys a rule as does alcohol - given in small doses it stimulates and later causes sleep, and finally in still larger doses further depression and death. Keller in his classical work on 'The Lake Dwellings of Switzerland' states that the garden poppy - papaverum somniferum - was found among the fruits of the villages

in Switzerland.[5] Also, there is a record of the papaverum rheoas having been found in the late Bronze Age huts at Minnis Bay, Kent,[6] and that it had a considerable narcotic effect.[7]

As one would expect, the Chinese were well versed in the use of opium. The ancient Chinese women gathered the herb Feu-i, a plantain which was supposed to facilitate labour, and the modern Chinese women use a decoction of a species of opium as a drink to combat abnormal and difficult labour.[8]

In an ancient Indian tale reference is made to hyocyamus as being given in order to send a patient into a deep sleep for the operation of Caesarean Section.[9]

There are records of Caesarean Section having been carried out from time immemorial - even the Greek goddesses having submitted to it. It is probable that in many cases they were often anaesthetised though not always. For this, among the few anaesthetics known among primitive people, alcohol would be by far the best as it would not impede labour to the same extent as drugs like opium. Gould and Pyle say the state of intoxication seems, by record of several cases, to render the birth painless.[10]

A reference is made to alcohol by Wecker in 1660 in a prescription for painless childbirth so that the delivery might be rapid and without pain, "take clary in sufficient

quantity, pound it well and press forth the juyce; take half a cup full, mingle it with wine and give to the woman to drink when she is in labour, then bind the herb that is pressed hot to her Navell". Clary is Salvia Sclarea, an antispasmodic and therefore cannot have had any anaesthetic effect.(11)

The negresses in the Moru district of Central Africa sustain themselves during labour by drinking native beer. They place a jar of it beside the bed, cover it with leaves to keep it cool, and drink from it by a tube.(12)

In the Canary Isles, as soon as labour has started, the woman is given a glass of brandy to strengthen her. Further description is also given of a Caesarean Section at Kahura in 1879 when the patient was liberally supplied with banana wine until in a state of severe intoxication.

Firdausi, in a description of how the mythical Rustrum was born, relates how the griffin who had nurtured Zal on Elburg had given him, on parting, some of her feathers and had directed him to burn one whenever he was in extreme distress. He did so and his kind nurse appeared. She told him it was necessary to make an incision in the side of Roudabah, and gave him intoxicating drugs which when administered to the princess would make her insensible to pain. Zal did as he was directed and the giant child "was cut from the side of his mother" who was soon restored to perfect health.(13)

Hemlock (conium maculatum) has been used as a local anaesthetic from classical times until now, but probably without effect as it is not absorbed through the unbroken skin.

Aristolochia, or birthwort, was much in demand for facilitating childbirth. It owes its power to its faculty for dulling pain and causing relaxation of the pelvic floor.

Urine was reputed to have many uses in labour. Dioscorides recommended urine for "such as are troubled with the stranglings of the wombe".(14)

In the East Indies, among the Doekoen, at a confinement, the oldest woman present gives urine for the patient to drink.(15)

Michel Entmuller says "urine hausta a mulieribus partum facilitat", and Salmon reports that "if a woman drinks her husband's urine she will have easy Travell".(16)

An interesting custom is described by Brand.(17) "A few years ago in this same village, the women in labour used to drink the urine of their husbands who were all the while stationed, as I have seen the cows in St. James' Park, straining themselves to give as much as they can."

An Arab method of local anaesthesia is described by Hilton Simpson in his book on Arab Medicine and Surgery. It is made from the excrement of the lizard, uromastrix

acanthinurus. The white excrement is dried and powdered and applied to wounds. This, of course, refers to the urine which consists mainly of urates. In recent years urea has been injected, with quinine, as a local anaesthetic for nerve block, and though it has great disadvantages, it does have an anaesthetic effect.

INHALATION

The property of certain volatile compounds to dull the conscious mind is no new discovery. The Scythians burned the leaves and capsule of cannabis indica and are described as being "transported with joy" after inhalation of the vapour.[18] There are records in the Ebers Papyrus of inhalation anaesthesia having been used.

The first known surgeon to have used inhalation anaesthesia for surgical purposes was Hoa Tho, in China around 115 - 205 A.D. He has been called the Hippocrates of China. The drugs he used were probably aconite, datura stramonium and hyocyamus[19] - aconite externally for the relief of pain and D. Stramonium for the spasma of asthma. In hyocyamus lay the real value of Hoa Tho's anaesthetic - it has a marked sedative effect on the cerebrum, so much so that it is now used as a premedication in the form of hyocine. Snow, in his book 'Chloroform and other anaes-

thetics" written in 1858 considers that Hoa Tho's anaesthetics were inhaled.

Shakespeare makes various references in his plays to inhalation anaesthetics.(20)

The earliest European record for inhalation anaesthesia having been used for actual surgery occurs in a work called "Passionarius Galeni" written by Gariopontus, an 11th century writer and compiled largely from the Greeks.(21)

The first step towards modern inhalation anaesthesia as we know it now, was the discovery of nitrous oxide by Priestly, in 1772, when he was treating iron filings with dilute nitric acid and heat.

In the early 19th century, Beddoes and Hickman in the course of their experiments with oxygen confined a puppy in an air-tight case and found that it became so overpowered by the increasing concentration of carbon dioxide that they could cut off its ear. Later Beddoes reported on the effects of nitrous oxide, but his papers were not acknowledged. Sir Humphrey Davy, 1778 - 1829, also experimented with nitrous oxide, but it was not until 1844 that Wells put it into practical use.

Following this, ethyl ether which had originally been prepared in the late 13th century by Raymond Lully and called sweet vitriol, shelved and brought out again by Paracelsus and later by Robert Boyle in 1690, came into vogue.

Peter Squire gave the first ether anaesthetic for Lord Liston at University College Hospital, London in 1846. On January 19th, 1847, Sir James Young Simpson conducted a confinement under ether but did not find it satisfactory owing to the irritation of the mucous membrane of the respiratory tract causing protracted coughing.

At the same time chloroform was being evolved. In March 1847 Flourens showed that the effect of chloroform and ether was similar, just as Faraday in 1818 had shown the similarity between nitrous oxide and ether in rendering the body unconscious.

Simpson, acting on these reports, used chloroform to mitigate the pains of labour in one case and found it so satisfactory that he applied the method to fifty more before publishing an account of the results.

The first man in America to use anaesthetics for childbirth was a dentist - Dr. Nathan Cooley Keep, one of the founders and first Dean of Harvard's School of Dentistry.(22) Ether was given intermittently synchronous with the pains, and he states that the suffering was "greatly mitigated", that "no unpleasant symptoms occurred" and that "the result was highly satisfactory." He states that he did not give enough to retard labour or produce unconsciousness.

Such revolutionary methods could not be expected to go unchallenged, and it is not surprising that many strong

arguments were put forward. Dignitaries of the Church were shocked and proclaimed that it was indecent and immoral to use chloroform to have babies. They quoted the Old Testament, "in sorrow shalt thou bring forth children". Simpson argued in their own language quoting the words of Genesis II verse 21, "and the Lord God caused a deep sleep to fall on Adam....".

It was not until on April 7th, 1853, after Snow had administered chloroform to Queen Victoria for the birth of Prince Leopold that the opposition really subsided.

No further advances were made in obstetric analgesia for nearly fifty years when in the very early 20th century 'twilight sleep' became the next popular method of relieving the pains of labour. Morphine and scopolamine were used. The dissention this time was not based on religious theories but on something equally fantastic. It was argued that mother-love depended on the degree of suffering at birth and if this were eased or abolished, then it would certainly become less and may finally vanish.

The modern methods of inhalation anaesthesia are discussed later. Great advances in the technique of administration of chloroform and ether have been made during the last fifty years. The discovery of cyclopropane by Freund in 1882 and the appreciation of its anaesthetic properties by Lucas and Henderson of Toronto in

1929, added greatly to the anaesthetists' armamentarium. In 1933 Ralph Waters made full clinical use of the properties; and in this country the investigations of Rowbotham, working at the Royal Cancer Hospital, London, proved its universal use.

Credit for introducing pentothal into surgery belongs mainly to Lundy of the Mayo Clinic (1934)

As far back as the year 2500 B.C. the ancient Egyptians used compression of the peripheral nerves as a means of producing local anaesthesia.

LOCAL and REGIONAL: Depictions of this were found on two door posts in the necropolis of Saqqarah by Loret whilst he was making excavations there. In one picture the surgeon is seen compressing the patient's antecubital fossa while he operates on his hand, and in the other the patient is possibly compressing his brachial plexus while the surgeon operates on his palm.[23] This practice of using pressure on the veins or nerves or both is well known. Later this method was suggested by Ambroise Paré and described by James Moore in 1784 in a book called 'A Method of Preventing or Diminishing Pain in Several Operations of Surgery'. He used a machine for the purpose. It is also fact that John Hunter amputated

a leg at St. George's Hospital under pressure on the anterior crural and sciatic nerves and declared that the pain had been less.

In India, the travelling gelders tie a ligature round the parts and amputate with one swift stroke of the knife, thus reducing pain to a minimum. The same method was adopted by Liégard in the early 19th century. He applied circular compression to the limbs, thus compressing nerves, arteries and veins. This method was used by the peasantry of Caen in the Middle Ages[24] and still is by old wives for minor ailments.

At the Seige of Troy the Greek surgeons were skilled in the application of alcohol and carbon dioxide to their wounds.[25] In the Iliad there are also references to the use of local anaesthetics in the treatment of wounds. The first is when Machaon is called to treat Menelaus "and when he saw the wound where the bitter arrow had alighted he sucked out the blood and cunningly spread thereon soothing drugs, such as Chiron of his good will had imparted to his sire",[26] and the second describes how Patroclus cut out an arrow from the thigh of Eurypylos "there he stretched him at length and cut with a knife the sharp arrow from his thigh and washed from it the black blood with warm water, and thereon he cast a bitter root rubbing it between his hands, a root that took pain away and undid all his anguish and the wound began to dry and the blood cleared".[24]

Pliny describes how a certain man with gout had "his legs rubbed all over with poisons, the result of which was that from that time forward all sensation, equally with all pain, was deadened in those parts of the body".[28] The poisons mentioned were in all probability vinegar mixed with powdered marble or "a special rock from Memphis powdered and mixed with sour lime".

Snow and ice were recommended, by Avicenna in his Canon, as local anaesthetics and later this same fact was noted by the French surgeon, Baron Larrey, during the Russian Campaign in the Napoleonic Wars. Most of the soldiers who were half frozen by the sub-zero temperatures did not mind amputation nearly so much as the warmer ones. The method of freezing was also used by the great Hunter.

In the 9th century Sendacher, an Indian doctor, recommended hot water for a sore throat.[29] A custom common among Hindus was to rub an abscess or the flesh with an escharotic, prior to incision, to diminish pain.[30]

The Peruvian Indians fill wounds with powdered cocoa leaves, which contain 9 per cent cocaine, to render an operation painless.

A local remedy for toothache is mentioned in the 'Leechbook of Bald' written around 900 A.D. This consists of a mixture of cinnamon and pepper made into a paste with honey and laid on the tooth.

The ancient Cymri used newts and beetles cancined in an iron pot and the powdered moistened and applied to the tooth before extraction.(31)

The local effect of mandragora chewed in the mouth was noted by William Turner, Dean of Wells, a 16th century herbalist and it was used in dental extractions. It was also recommended by Pliny for pain in the eye.

Aconite was used locally as long ago as Pompeii. Dr. S.A. Ranking, in a paper read at the Seventeenth International Congress of Medicine in 1913, mentions that a surgeon Rhaziz in Azudi Hospital, Bagdad, saw a swelling of the forearm cured by the application of a plant which was later called the 'Vivifier of the World'.

There are also records of old Brahman priests who mixed some herbs with sandal paste and rubbed it over the body to make it insensitive to heat.(32)

There is an interesting story written in 1595 in the 'Church and Witchcraft' Series, of a charlatan who used to rub his body with herbs and then sit in front of the High Altar naked to the waist and beat himself with flints and whips. After he had been enriched by his lucrative begging he used to return home and rub his wounds with herbs which produced the effect of local anaesthesia.(33)

The reputation of witches to fly through the air arose from their practice of anaesthetising the skin. When the

cauldron was finished boiling the residue was turned out and rubbed on the skin. The impression obtained was one of 'floating on air'.[34]

Eric Stone writing a paper entitled 'Medicine among the American Indians'[35] mentions how several tribes used infusions of various plants to render their skins insensible to heat. The Zuni used yarrow. The Hyoka of Omaha chewed and rubbed mucilaginous red falso mallow on their hands before picking articles out of boiling water. The dancers of the Navajo Fire Dance rubbed themselves with white clay which in the low temperature of burning cedar wood bark prevented burns and blisters as they passed through the flames.

In Northern Rhodesia the native midwives employ the juice of the 'Shikantzo' plant to lessen the pain of birth. The tuberous root is crushed and rubbed in their hands and then applied to the walls of the vagina, producing a local anaesthetic effect.[36]

Pliny describes a very quaint anaesthetic. He says that the ashes of the skin of the crocodile, applied with vinegar to such parts of the body as are about to undergo incision, or indeed the very smell of the skin when burning, will render the patient insensible to the knife.[37]

Ambroise Paré (1517 - 1590) used as a cure for headaches a cloth dipped in oil of roses, waterlilies, poppies

and a little opium mixed with rose vinegar and applied it to the forehead.[38]

The greatest of all modern drugs used for local application is cocaine which was isolated from Erythroxylon Coca in 1860 by Niemann. Its effect had been known to the people of South America for hundreds of years. They regarded their Coca plant as a gift from the gods because from chewing the leaves the hungry were satisfied, the weak strengthened and the happy forgot their troubles. Knowing this, these people were aware of its numbing effect and had used it as a local anaesthetic in the field of surgery. There is one method described whereby one of the assistants chewed the leaves and spat into the field of operation whilst the surgeon worked - the spit producing a local numbing effect.

After the discovery of cocaine in 1860 the full significance of its properties was not appreciated till 1880. Then, Karl Koller, M.D., a Bohemian working in Vienna, was attracted by the numbing effect which the drug had on the mucous membrane despite its stimulating effect on the psyche, respiration and heart action. For many years he had been trying the action of various solutions and drugs to numb the eyes of laboratory animals. He had tried morphine, bromides and chloral without effect. Sigmund Freud who was interested in the psyche effect, procured a

small amount of the drug and asked Koller to join him in trying out its effects. Freud measured the increased muscular power with a dynamometer. Shortly after this he left for Hamburg to visit his fiancee, and Koller was left with his thoughts and some cocaine. Remembering his original quest for something to numb the eyes, he suddenly recalled that when he and Freud had swallowed the drug they had both remarked on the numbness of their tongues. He then dissolved some cocaine in water and dropped it into a frog's eyes and found on touching that the eyes were insensitive. He obtained the same results with the guinea pig. This happened in September 1884. He immediately sent a report to the German Ophthalmological Society at Heidelberg. This report met with tremendous ovation and by October 1884, Knapp in New York had reported local effects on the ears, mouth, nose, larynx, trachea, urethra and rectum. By December 1884 further similar effects were reported on the teeth, in gynaecology and in surgery. Koller went to America shortly after his discovery of cocaine anaesthesia and devoted himself to the practice of ophthalmology in New York City until he died in March 1944 aged 86.(39)

The local anaesthetic use of cocaine as we know it today was made possible by the invention of the hypodermic syringe. The first crude syringe was invented in 1840,

and this was improved in 1853 by a Scots physician, Alexander Wood, and a Frenchman, Charles Pravaz, who perfected the hollow needle.

In 1885 - 1886 William Halsted, a famous New York surgeon, commenced a monograph on 'the use and abuse of cocaine', but this was never completed because for two years he became an addict. He regained his health and was Professor of Surgery in John Hopkins Hospital from 1889 till his death in 1922. It was he who established the facts that are in force now - (1) that to anaesthetise the skin one must inject directly into it and not under it, and (2) that by injecting round the main trunk of a nerve one could make a whole area numb. Another interesting point, en passant, is that in 1890 he introduced rubber gloves into surgery. It is said that this was to preserve the hands of a certain nurse who later became his wife.

The next great step in advancement was the realisation that the drug must be kept out of the general circulation so that the local effect could be prolonged. Many methods, including tourniquets, were used until in 1901 Dr. Heinrich Braun of Zwichau, Germany, announced what he called his 'chemical tourniquet'.(40) He mixed extract of the adrenal gland of the sheep - adrenalin - with cocaine; this caused vaso-constriction and consequently intensified and prolonged its action at the site of injection.

In 1904 in Germany, Alfred Einhorn, by his remarkable discovery of novocaine, gave us a much safer and less toxic drug than cocaine. At the same time its counterpart procaine was introduced in America. Today there are many derivatives.

The effect of intrathecal injection of cocaine was first made use of as a spinal anaesthetic by August Bier at the close of the last century. Within the next decade the replacement of cocaine by stovain brought the method into general use. Safer cocaine derivatives have since been isolated, and with the discovery of nupercaine, which is a quinoline derivative, many of the drawbacks of this method of anaesthesia may eventually be overcome.

The comparatively new technique of extra aural injection developed by Robert Hingson and Waldo Edwards in 1942 has not yet stood the test of time.(41)

THE

VOLATILE

ANAESTHETICS

INHALATION ANAESTHESIA

MODE OF ACTION: The volatile anaesthetics produce their effect by reducing the metabolic activities of the body cells. Whether they act directly on the intracellular protoplasm, or by altering the permeability of the cell membrane, this reduction of metabolic activity is dependent on oxygen starvation. Regarded in this light, they may be classed as protoplasmic poisons. It is their predilection for the nerve cells of the brain that gives them the power of rendering the body insensitive to pain, and their virtue lies in the fact that the higher centres are affected early, and the medullary centres only later and with higher concentrations.

Although the brain under the influence of such agents will fail to appreciate pain, the higher centres are constantly bombarded with afferent stimuli arising in the operative field. It is important to bear this in mind when considering the incidence of surgical shock.

Whilst acknowledging that their main effect is on the cells of the higher centres, it cannot be denied that, owing to their very nature and method of absorption, every cell in the body is subjected in some degree to the influence of such anaesthetics. They are by nature diffuse in action. In the pregnant woman, therefore, the foetus will be subjected to

them through diffusion across the placenta.

However expert the anaesthetist, there is always an element of risk in the administration of these anaesthetics. The very fact that any treatise on the subject includes a long list of possible accidents and sequelae bears witness that modern anaesthesia is by no means the perfect pain preventative. The prime consideration must always be the safety of the patient, and the efficiency of anaesthesia secondary to this. It is true that the efficiency of a properly administered in-halation anaesthetic is almost without equal, though this naturally varies with the agent used - but what of the dangers?

Minnett and Gillies[٤٣] list the immediate dangers under three headings:

(1) Vomiting during induction.

DANGERS: (2) Respiratory failure.

(3) Circulatory failure.

Vomiting whilst the cough reflex is depressed subjects the patient to the risk of inhalation of fluid or solid vomit into the larynx with the very real danger of asphyxia or pneumonia subsequently.

Failure of respiration may arise from mechanical obstruction to the air passages, or from depression of the medullary centres due directly to the toxic action of the anaesthetic agent, a not infrequent happening under the influence of

cyclopropane and rapidly administered intravenous barbiturates.

Chloroform, ethyl chloride and other halogenated hydrocarbons, have been known to cause Primary Syncope, possibly due to vagal inhibition during induction.

Secondary Syncope has occurred as the result of embarrassed respirations towards the end of induction, frequently under chloroform. The mechanism of this event is probably over distension of the right heart due to inspiratory efforts against resistance. If these conditions arise any heart will ultimately fail whatever the anaesthetic, but since chloroform and ethyl chloride are themselves heart poisons, it is with these more likely to occur - it is almost certainly the commonest fatal accident of anaesthesia.

Even in the absence of any possibility of overdosage Reflex Syncope has been reported during the use of chloroform, from vagal inhibition or depression of the Sinoauricular node; Paul White[43] considers cardiac fibrillation to be the cause.

Post-operative vomiting of some degree appears to be a frequent occurrence after volatile anaesthesia, but happily it is, as a rule, but an unpleasant experience for the patient; at times, however, it is very distressing and in severe cases may give rise to ketosis. It is absent after spinal, regional and intravenous

SEQUELAE:

barbiturate anaesthesia, and the latter used pre-operatively, diminishes its incidence.

Smith of Liverpool[44] in a survey of 441 operation cases of various types subjected to inhalation anaesthesia, found 20.1 per cent had after-vomiting to a greater or less extent, and 7.2 per cent suffered for over ten hours.

Post-operative ketosis of serious degree may, in rare cases follow. Chloroform appears to be the most usual cause. The ketosis, according to Langton Hewer,[45] is due to the fact that by virtue of its lipoid solubility chloroform prevents lipoid-containing cells from utilizing oxygen for the complete oxidation of carbohydrate, thus liberating oxybutyric acid into the blood stream.

Those agents which are rapidly eliminated from the body, such as nitrous oxide, cyclopropane and divinyl ether, give rise least often to post-operative nausea or vomiting, and it is important to remember that the use of morphine both pre- and post-operatively may increase the likelihood of these events by vagal stimulation.

Respiratory tract infections still hold first place as the most troublesome of post-operative sequelae. After operations performed under any anaesthetic, including spinal and regional anaesthesia, there is always the possibility of pneumonia or bronchitis. Many factors influence the susceptibility of the respiratory mucous membrane to infection

and though the incidence of infection varies relatively to the irritating properties of the gas mixture, the most striking fact is its very much higher incidence after abdominal operations as compared to others. This generalisation excludes thoracic surgery which carries its own special risks. Such factors as prolonged respiratory depression, excess pre- and post-operative medication and inadequate intake of oxygen will all predispose to infection, especially in small areas of collapse. These are all chiefly concerned with the method of inhalation anaesthesia rather than the actual gases used. The temperature of the gas mixture and its irritating properties are factors directly dependent on the anaesthetic agent.

Amongst other possible sequelae of inhalation anaesthesia, the following have been reported in the literature:- peripheral circulatory failure under chloroform and ether, permanent damage to the cells of the cerebral cortex from prolonged anoxia, headache and conjunctivitis.

In order to preserve a sense of proportion, it is necessary to attempt to determine the relative incidence of the many accidents and sequelae mentioned above. It is rare, in these days of highly skilled anaesthetists, for patients to die from mechanical asphyxia; however cardiac arrest and respiratory failure do occur even though infrequently. The fact that Hamilton

INCIDENCE of SEQUELAE:

Bailey[46] still encounters this in a very large and varied surgical practice, in the proportion of one in every five hundred cases, is significant enough.

The incidence of post-operative pulmonary complications naturally varies from clinic to clinic, but all reports tell the same tale when comparing abdominal with non-abdominal operations. Beard[47] writing in the Post-Graduate Medical Journal 1948, states that 13 per cent of 3,000 abdominal cases developed post-operative chest complications as compared with 1 per cent in 4,000 cases of non-abdominal surgery; further, he holds that post-operative bronchopneumonia in debilitated subjects carries a mortality of 30 per cent. He goes on to say that the type of anaesthetic (general) has little effect on the incidence of these complications. This view is hardly consistent with the fact that pentothal and cyclopropane both tend to cause bronchospasm, thus facilitating bronchiole block by otherwise harmless small mucus plugs, whilst ether is a broncho-dilator. Perhaps the increased secretions accompanying ether inhalation counteract the advantages that would be expected from its action on the bronchi. The cough reflex is depressed by all anaesthetics (general).

In the accompanying table are shown figures from various sources indicating the incidence of post-operative pulmonary complications at different periods of the present

century.

Incidence of Post-operative Pulmonary Complications.		
0.45%	Corner & Crouch.	Trans.Soc.Anaes., 5.
1.1 %	Smith.	B.M.J, Ap. 1922.
1.51%	Alma Vediss.	Wom.Med.Soc. N.Y. 1921.
2.6 %	Whipple.	Surg.Gynae.,Obst. Jan.1918.
6 %	Ravenstine,E.A & Taylard,I.B.	Am. J. M. Sc., 1936.
8.9 %	King, D.S.	Mass. Gen. Hosp.

The higher incidence in the more recent reports has presumably resulted from the better recognition of such occurrences as bronchitis, atelectasis, bronchopneumonia, lung abscess, empyema, subphrenic abscess and pulmonary embolism.[47][48]

CHLOROFORM, ETHER, CYCLOPROPANE and NITROUS OXIDE IN RELATION TO CAESAREAN SECTION

The choice of anaesthesia for the operation of Caesarean Section is influenced by the consideration of two individuals, the mother and the foetus, whose circulations are in such intimate contact. There is no virtue in subjecting the baby to the action of volatile anaesthetics - it can only add to the vicissitudes of the first few days of life - and this fact alone should stimulate the search for an agent which has

no such effect.

But this is by no means the only consideration peculiar to the operation of Caesarean Section. The operation must frequently be performed as an emergency, when the patient's strength has been sapped by prolonged and exhausting labour, or by haemorrhage and shock, or by infection, or from some organic disease. The stomach may be full, and with the large abdominal tumour, the increased possibility of vomiting during induction by inhalation anaesthesia presents an additional risk. The light plane of anaesthesia aimed at increases the occurrence of vomiting and favours the inhalation of vomitus by depression of the cough reflex. McIntosh Marshall reported three deaths from this cause and a number of non-fatal cases of severe aspiration pneumonia.[49] This very real danger was stressed by Mendelson, and Hartzell and Mininger, in 1946.[50][51] The former, reporting on the occurrence of aspiration of stomach contents in 44,016 obstetric patients in the New York Lying-in Hospital during anaesthesia, gives an incidence of 0.15 per cent (66 cases). In five cases the aspirated matter was solid, and of these, two died from complete obstruction of the airways and two developed massive atelectasis with subsequent recovery. Following aspiration of liquid vomit varying degrees of bronchitis and mild bronchopneumonia occurred. Chemotherapy appears to have no effect on the course of these pneumonias according to Hartzell and Mininger.

The metabolism of the pregnant woman is notably unstable, and the endocrinal and metabolic revolution which accompanies the separation of the child from the mother renders her more prone to the toxic effects of the anaesthetics. Two organs in particular are susceptible above all others, these are the liver and the kidneys; and when these have already been subjected to injury as in pre-eclampsia or eclampsia the limits of safety may be very small.

One of the aims of the operation must always be the preservation or enhancement of the normal uterine contraction and retraction. The delay in or impairment of uterine activity long recognised as a concommitant of inhalation anaesthesia, may progress to a state of uterine atony with the danger of serious post-partum haemorrhage.(42a)(52)(53)(54) In the case of ether and cyclopropane, this effect may be counteracted with ergot and other oxytoxic drugs, but chloroform presents a more difficult problem. Spinal analgesia has the opposite effect in that it causes strong uterine retraction; whilst local analgesia has no effect whatsoever on the uterine musculature.

Foetal asphyxia is much more common under ether anaesthesia than when spinal or local analgesia is employed.

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Anoxia of the mother, which frequently follows laryngeal spasm or vomiting during induction, is rapidly reflected on the foetus. Massey Dawkins[55] in a series of

94 cases of Caesarean section performed under Gas, Oxygen & Ether, found that 46 per cent of the babies required lobeline and carbon-dioxide and oxygen to initiate respiration. There are many who agree with Gillies that in the full-term infant which has not suffered the strain of a long labour this is of little consequence; this is not the counsel of perfection, and in the knowledge that it can be avoided, such reasoning is not justifiable. Certainly in the case of the premature infant there is no justification for jeopardising its life in this way.

Chloroform is justly condemned as an anaesthetic for Caesarean section as it interferes seriously with uterine activity[42c][52b] and on account of the physiology of the pregnant and parturient woman which makes her especially prone to its toxic effects. Dmitriev[56] and Bompiani[57] both reported death from its use in Caesarean section in 1931 and many eminent authorities have urged against its use both in obstetrics and general surgery. Minnitt and Gillies[42d] consider that it should only be used if no other form of anaesthesia is applicable stressing the immediate danger of cardiac arrest from depression of the Sinoauricular node, and the delayed toxic action on the liver and general metabolism. To these Helliwell and Michael Hutton[53] add the very real danger of toxicity on the child.

CHLOROFORM:

The other two volatile anaesthetics employed in Caesarean Section, namely ether and cyclopropane, also carry with them the same risks as choroform, but to a considerably less degree. Uterine atony, mild acidosis and some degree of foetal asphyxia are common with ether, and, under certain conditions, may arise to a serious degree. Though ether is far less toxic than chloroform it must be remembered that in pregnancy the liver and kidneys are particularly susceptible to noxious influences. Marshall attributed two deaths in his series to hepato-renal failure in toxaemias under ether. Of twenty deaths following Caesarean Section in Liverpool Maternity Hospital 1932 - 1939, three were definitely due to uterine atony and haemorrhage, and all were under ether anaesthesia. Amongst the disadvantages of ether anaesthesia may be mentioned its influence on the bowel and peritoneum, whereby it depresses peristalsis and lowers the resistance of the peritoneum.(54)(93) It is important to take these facts into consideration before adding to the dangers of the peritoneal manipulation unavoidable in the operation for Caesarean Section, remembering that ileus and peritonitis are not uncommon causes of death. Ether convulsions, first reported by Wilson in 1926 are not unknown today.

ETHER:

Cyclopropane, by virtue of its rapid elimination and the high oxygen concentration with which it is given, has obvious advantages over other volatile anaesthetics.[42][93] It has

CYCLOPROPANE: however, also a high degree of lipoid solubility though less than chloroform and ether, and like them its action is dependant on reduction of cell metabolism. It has little or no depressant effect on the foetus according to Helliwell and Hutton.[53] Bourne and Williams[60] consider that it is particularly useful in Caesarean Section on account of the high oxygen concentration referred to above, and in their experience it has a powerful positive effect on uterine contraction. However, its advantages are somewhat offset by three properties peculiar to it: (1) the medullary respiratory centre may become rapidly and profoundly affected before the skeletal musculature is properly relaxed, (2) cardiac arrhythmias are frequent during and after its use[96] and may occasionally, though rarely, give rise to alarm and (3) muscular relaxation is not so good as that obtained with ether, owing to the danger of "pushing the anaesthetic".[42]c

With nitrous oxide alone, it is just possible to obtain anaesthesia by not allowing the oxygen concentration

NITROUS OXIDE: to exceed 20 per cent. In such proportions of nitrous oxide and oxygen only individuals

of poor physique will be anaesthetised, or those whose metabolism has been depressed by shock or premedication. In the healthy pregnant woman, therefore, anoxia of the foetus is bound to occur and therefore this form of anaesthesia has no place in the operation of Caesarean Section.

Before leaving the subject of inhalation anaesthesia reference must be made to two important considerations from the point of view of the surgeon, namely relaxation of the abdominal wall, and the degree of bleeding in the operative field. Although the former is not so important in the operation of Caesarean Section, there is no doubt that regional anaesthesia is vastly superior to general in this respect, and excessive bleeding is distinctly rare with regional and spinal anaesthesia, whilst during inhalation it is common and can be very distracting to the surgeon.(54)b. The volatile anaesthetics all cause vasodilatation, and ether and cyclopropane(93) in addition initiate an increased cardiac output, still further favouring bleeding. It follows that with inhalation methods, bleeding can only be minimised by producing deep anaesthesia which, by central depression, will cause a lowering of the blood pressure - a state not to be entertained in the operation of Caesarean Section.

THE

NON-VOLATILE

ANAESTHETICS

Anaesthesia by non-volatile substances can be induced in four different ways; by injection (1) intravenously, (2) intrathecally, (3) into the epidural space, or (4) as a regional or local block. All have been used in the operation of Caesarean Section to a greater or lesser degree.

INTRAVENOUS

It would seem that intravenous barbiturates are now rarely employed in Great Britain for this purpose. Controlability is difficult, depending on the rate of injection of the drug and its rate of detoxication in the body tissues - a slow process and one varying greatly with different individuals.(42)f. As with the volatile anaesthetics, the infant is not immune from respiratory depression. Moreover it would frequently be contraindicated in emergency cases with pre-existing liver or kidney disease, severe shock, myocardial weakness and anoxia.(61) Its only advantages over the inhalation anaesthetics are the ease and smoothness of induction, and the minimal incidence of post-operative vomiting. Pulmonary complications are reputed to be less frequent, presumably due to the fact that there is no irritant action on the respiratory mucous membrane, but this is by no means certain.

Greenhill(62) has recently emphasised that in Caesarean Section the pentothal must be withheld until just before the

uterus is incised to protect the infant from respiratory depression. It is interesting to note that he uses local infiltration up to this point.

SPINAL

In spite of various reports of untoward effects from its use, spinal analgesia has enjoyed, and in some clinics still does enjoy, considerable popularity in the operation of Caesarean Section by virtue of certain

ADVANTAGES: undoubted advantages it holds over general anaesthesia. Its efficiency as an analgesic and the complete relaxation it affords are incontrovertible. In contradistinction to the volatile anaesthetics, it has a marked positive effect on uterine contraction,[63][64] and as Marshall pointed out this accounts for the rare necessity for manual removal of the placenta, and the rarity of delayed haemorrhage; it also accounts for the comparatively little bleeding during the operation.[64][65][66] Hanisch and Siegert (1934 quoted) hold that immediate closure of the uterine sinuses and sustained retraction with a minimal blood loss are the preliminary requisites for an afebrile puerperium. Spinal analgesia appears to have little if any toxic action on the liver and kidneys, and unlike ether, does not tend to produce ketosis.[67] Further, it increases intestinal peristalsis and post-operative vomiting is rare.

Meteorism and ileus are uncommon after its use.

From a consideration of certain reports, it appears that pregnancy tends to initiate an idiosyncrasy to spinal analgesia in certain woman. Spencer (1937) quotes De Lee, Kronig, Brouha, Voron, Winter and Halban as supporters of the view that the cause of this is sensitivity of the bulbar centres to cocaine compounds in pregnant women.[68] If this is so, the use of nupercaine, which is a quinoline derivative, should obviate this occurrence. A recent report by Rufus Thomas[64] (1947) is encouraging. In his series of 346 Caesarean sections under spinal anaesthesia, he employed this drug in every case, and stated that there were no maternal deaths either under or due to the anaesthetic. However, it is too early to say that in nupercaine lies the answer to this danger, and it would be as well to remember the experiences of Preissecker who found the greater mortality in the pregnant women than in the non-pregnant women during spinal anaesthesia so striking.[69]

DANGERS:

Franken, in 1934, reviewing 2,000 sections by twenty different operators, found that fourteen maternal deaths (0.7 per cent) were due solely to spinal anaesthesia.[70] Isolated reports of death under spinal anaesthesia during Caesarean section continue to appear.[71]

Mushin[63] notes that in Caesarean Section under spinal anaesthesia with a large baby or hydrammios, there are not infrequent moments of anxiety when the patient becomes slightly cyanosed, rapid recovery occurring as soon as the baby is delivered. Hendry, Baird,[72] Marshall and Greenhill have all experienced such moments during section under this method. According to Mushin, a spinal for an abdominal operation necessitates paralysis of the intercostal muscles and the diaphragm cannot maintain the function of respiration in the presence of a large abdominal tumour. To quote his words "beware of those who have an abdominal tumour of such a size that the diaphragm is pushed up".

There are few references in the literature to the incidence of foetal respiratory depression after spinal anaesthesia in Caesarean Section but the impression is that asphyxia is much less common than with inhalation anaesthesia. Kawaguchi[73] in 1933 gave 23.6 per cent and 50 per cent as the asphyxia rate in infants delivered under spinal and ether anaesthesia respectively, whilst Puppell[74] in 1935, gave 16.6 per cent and 60.4 per cent, the latter under an ether-chloroform mixture.

EFFECT ON FOETUS:

Some reported figures of foetal mortality are of interest. Siegert, quoted, in a series of 191 Caesarean sections

using spinal anaesthesia, had a foetal mortality of 2.1 per cent, but stated that no deaths were due to the anaesthetic.

FOETAL MORTALITY: Preissecker in 150 cases under spinal had a foetal mortality of 2.67 per cent as compared with 8.22 per cent of 632 cases under ether. In 1947 Rufus Thomas[64] reported two stillbirths and ten neonatal deaths in 346 Caesarean sections performed under spinal; there were 350 infants, giving a mortality rate of 3.43 per cent. Irving[75] has recently analysed the foetal mortality in relation to anaesthesia in a series of 1887 consecutive Caesarean sections at the Boston Lying-in Hospital, between the years of 1934 and 1943. Of 1159 infants delivered under ether anaesthesia there were 31 stillbirths and 47 neonatal deaths, giving a mortality rate of 6.73 per cent, whilst of 241 infants delivered under spinal anaesthesia there were 5 stillbirths and 11 neonatal deaths, giving a slightly lower mortality of 6.64 per cent. These statistics do not give a fair comparison since spinal was used for the most part in those cases where the risk to the infant was greatest.

The reports are summarised in the following table:

Source.	ETHER. No.of infants delivered.	Mortality.	SPINAL. No.of infants delivered.	Mortality.
Preissecker 1934	632	8.22%	150	2.67%
Irving 1945	1,159	6.73%	241	6.64%
Thomas 1947	-	-	350	3.4%
Siegert 1933	-	-	191	2.1%

(Mortality means Stillbirths and Neonatal Deaths.)

The work of Eisenberger (1932)(76) supports the view that spinal is better than inhalation anaesthesia as far as infant mortality is concerned though some authorities regard the exaggerated uterine tone as a potential cause of foetal embarrassment.

Certain definite contraindications to spinal analgesia would in themselves prohibit its use in many cases of Caesarean Section. In severe shock its propensity for lowering the systemic blood pressure renders it dangerous in the extreme. Sudden collapse and death from a fall in blood pressure due to paralysis of the vasoconstrictors and dilatation of the splanchnic vessels is not unknown, though recent reports indicate that this may be avoided by the

CONTRA - INDICATIONS:

pre-operative use of ephedrine and the injection of other vasopressor substances either pre-operatively or during operation.[64][47][48] Thomas, although admitting that severe anaemia and low systolic blood pressure are contraindications to spinal anaesthesia used the method with success in 58 cases of placenta praevia, concluding that such patients "can, by blood transfusion and other means, be rendered fit for spinal anaesthesia". Surely it should only be necessary to render the patient fit for operation! It is significant that it was in these very cases that Hendry and Baird most frequently encountered collapse.[72]

Other contraindications to spinal anaesthesia are myocardial disease, disease of the central nervous system and local sepsis or disease of the spine.[63][64][78] Extensive vertebral deformity may prevent access to the spinal theca. Great deliberation is necessary in cases of severe anaemia nervousness and emotionalism. To these may be added lung disease with little respiratory reserve, and deficient renal function which would be further impaired by lowering of the systolic blood pressure;[63] it is this fact also that renders its use unwise in cases of myocardial disease, as the coronary flow is dependent on the systolic blood pressure Even its action of increasing peristalsis may become a hindrance rather than an asset, aiding peritoneal spread in the presence of infection.[42g]

A formidable list of possible complications of spinal anaesthesia has been collected from the literature. According to Langton Hewer (1948)[48] the incidence of headache is as high as 30 per cent and post-operative nausea and vomiting occur in 34.6 per cent of cases. The usual figure given for the former is between 5 and 10 per cent. Mushin, however though not committing himself, states that it is probably much higher and the experience of Resnick[78] seems to confirm this. Permanent paralyses were reported in 6 cases out of 23,000 spinal block by Schildt in 1947.[79] Transient cranial nerve palsies, spinal meningitis and ascending myelitis have been described by Russell Brain[80] and Hewer.[48] Lesions of the cauda equina and conus medullaris, radiculo-myelitis, sacral radiculitis, focal cerebral lesions and precipitations of hitherto concealed neurological disease are other possible neurological complications instanced by Macdonald Critchley, arising either from trauma or infection. Hyperpyrexia occurs occasionally as a transient phenomenon.[63]

SEQUELAE:

Retention of urine is usually slight and of short duration, but may be severe and permanent through damage to the sacral nerve roots.[81] Respiratory complications are probably no less frequent than with other forms of anaesthesia,[42b] Backache is sometimes troublesome.[48]

The technique of epidural injection was introduced with a view to minimising some of the dangers arising from use of the intrathecal method whilst preserving its advantages, as by this route the drug is prevented from entering the cerebrospinal fluid. No large series has been reported in Caesarean Section but the contraindications would appear to differ little from those of spinal analgesia. The technique is difficult and prone to failure in the most experienced hands.[82] The time for the drug to act is considerable and if an additional anaesthetic should be necessary, many valuable minutes may be lost. Helliwell and Hutton[53] state that anaemia and dehydration, placenta praevia, premature separation of the placenta and disproportion all forbid its use; and they stress the danger of infection.

EPIDURAL:

Massey Dawkins[55] from his experience of this method of anaesthesia in 20 cases of Caesarean section, holds that there is no risk of meningitis or nerve palsies and that the fall in blood pressure is less than that occurring when the intrathecal method is used. Post-operative headache, chest complications and dysuria did not occur in any of his cases, and post-operative vomiting was rare. Retraction of the uterus was strong and post-partum haemorrhage was absent. It is significant that ephedrine was required in most cases, and 25 minutes had elapsed from the time of injection.

Caudal anaesthesia embraces the same principles as the epidural methods, the injection being made into the sacral canal via the sacral hiatus. Peel[83] has recently reported on the use of this anaesthetic in 51 cases of Caesarean section. Difficulty in technique precluded its use in a number of other cases; anatomical variations of the sacrum occur in about 10 per cent of people, and excess adipose tissue obscures the sacral hiatus in a further 10 to 15 per cent. Other disadvantages include the necessity for an anaesthetist experienced in the technique, the accidental tapping of the subarachnoid space which may be placed low, and the fact that 20 to 40 minutes is required for the anaesthetic to take effect. Peel considers recent haemorrhage and low blood pressure to be the chief contraindications, although only in a few cases did he experience appreciable fall in blood pressure during its use. He agrees with Massey Dawkins that the risk of meningitis, nerve palsies and headache is absent, though in the experience of Snoeck and Rocmans of Brussels this is certainly not the case.[84]

CAUDAL:

In an attempt to classify the relative advantages to the mother of spinal analgesia, compared with inhalation anaesthesia, the following table has been compiled from reports by Geller, Marshall and others.

SOURCE.	GENERAL		SPINAL.	
	No. of cases.	Reduced. mortality	No. of cases	Reduced mortality.
SIEGERT 1933.	-	-	191	1.5%
Preissecker. 1933.	482	3.2%	150	1.3%
Geller 1935.	210	3.8%	71	1.4%
Liverpool Mat.Hosp. 1932-36.	488	2.2%	250	1.6%
Marshall 1937.	60	0.0% unreduced.	112	0.0% unreduced.
Thomas 1947.	-	-	314	0.0% unreduced
Peel 1947	-	-	51 Caudal	0.0% unreduced.
Obst.Dept. U.C.Hosp. 1944-46 Massey Dawkins	100	1% paralytic ileus.	20 Epi-dural.	0.0% unreduced.

With reference to the figures obtained from the Liverpool Maternity Hospital, Marshall gives it as his opinion that of the total deaths occurring, one third could be attributed mainly to the anaesthetic, five during ether and only one during spinal. Ginglinger[85] in 1937, in a similar comparison of 237 cases operated on under ether and 248 under spinal analgesia, gave the relative anaesthetic mortality as 1.68 per cent and 1.2 per cent respectively. In the latter group all three deaths were due to syncope

following injection of the drug. Bronchopneumonia and atony-haemorrhage each accounted for two of the total four deaths from ether.

CONCLUSION:

From the foregoing review it is reasonable to conclude that spinal analgesia is superior to inhalation methods for the operation of Caesarean section as regards the safety of the mother and the child, but it is by no means the ideal. Moreover, it still has its opponents in the highest obstetrical spheres both in this country and America. Greenhill[62] is still of the opinion that spinal anaesthesia is particularly dangerous during Caesarean section, in spite of the many successful results reported, holding that those who have been fortunate enough to have had no fatalities have had, nevertheless, many anxious moments. Irving (1945)[75] is not convinced of what he calls "the alleged fact that the uterus contracts well at Caesarean section" under spinal anaesthesia, stating that it contracted so badly in three out of 261 cases at the Boston Lying-in Hospital that hysterectomy was found necessary.[75] In his analysis of 1887 cases of Caesarean section done under various anaesthetics, he concluded that cyclopropane, local anaesthesia and open ether gave the best results as far as full term infants were concerned, whilst spinal and local analgesia gave the best results among premature infants.

In this operation where two lives are at stake, more than in any other is it wise to confine the anaesthetic agent to the operative field. Spinal anaesthesia only partly achieves this goal, in that it spares the foetus and the upper half of the body whilst paralysing the lower half causing loss of control of the pelvic viscera and abolishing vasomotor tone throughout the anaesthetic area. Even the protagonists of spinal and general anaesthesia acknowledge the superiority of local analgesia in certain abnormal conditions of the mother (noteably cardiac decompensation), and yet they continue to deny to the healthy woman a method of anaesthesia which, on their own admission, is the safest of all.

It was the realisation of the dangers and sequelae, however remote, of other forms of anaesthesia, and the desire to help to solve this strange paradox that stimulated the writer to test the efficacy of local analgesia.

THE MATERIAL

98

LOWER SEGMENT CAESAREAN SECTIONS

PERFORMED BY THE WRITER

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Before discussing the advantages of local analgesia in the operation of lower segment Caesarean section, a short account will be given of the material on which the opinions of the writer are based.

A series of 98 consecutive lower segment operations was performed personally between the years 1943 and 1948 using this method of anaesthesia. Roughly half of these cases were poor operative risks, and 66 are fully analysed in the appendix. The purpose of this analysis is to show that this method is equally advantageous to all cases. The accompanying table shows the main indication for section, the red figures denoting the 'bad risks'.

INDICATION.	Numbers.		TOTAL
Contracted pelvis and Disproportion	35	3	38.
Uterine Inertia	2	4	6
Foetal Distress	-	4	4
Malpresentation	5	2	7
Fibroids	3	-	3
Bad Obstetric History	5	2	7
Placenta Praevia	-	16	16
Accidental Haemorrhage	-	2	2
Prolapsed Cord	-	3	3
Heart Disease	-	8	8
Diabetes	-	2	2
Pre-eclamptic Toxaemia	-	2	2
	50	48	98

The following synopses are intended to show the wide applicability of local analgesia in cases where there is a risk to the mother or to the foetus or to both. Out of the 66 fully analysed cases, 32 could be placed in this category and are so indicated in the appendix. The remaining 34 cases consisted mainly of either repeat Caesarean sections or sections for disproportion where no particular risk existed. With reference to the 32 cases not included in the appendix any particular point of interest is noted under the appropriate heading; of these 16 fall into the group of 'poor operative risk'.

CONTRACTED PELVIS and DISPROPORTION

There were three cases of contracted pelvis and disproportion of special interest.

Case No. 43 was a primigravida, aged 34, who had had rickets in childhood and had a generally contracted pelvis. On account of pre-eclamptic toxaemia she was admitted for rest. She had albuminuria, a blood pressure of 140/110 and oedema of her ankles. Premature rupture of the membranes occurred and labour followed after a latent period of 8½ hours. After a trial of labour lasting 18½ hours Caesarean Section was performed. The child weighed 6 lbs. 4 ozs. and cried at once.

Case No. 34 was aged 40 and had been married for 24 years. She had had a Classical Caesarean section 12 years previously for contracted pelvis. An elective repeat lower segment section was carried out. The child cried at birth and weighed 8 lbs. 4 ozs.

There was one other case, that of an unmarried girl who came to Hospital for the first time on her ? expected date. She had severe rickets and had had a previous section for that reason two years before. Her nutritional state was poor and she was anaemic. She was given one pint of blood on admission and arrangements were made to perform an elective section two days later unless labour intervened when this would be done immediately. She did not go into labour and the pre-arranged section was performed. The child cried at once and weighed 8 lbs. She made a good recovery and the puerperium was afebrile. The child developed a pyloric stenosis and was operated on under local analgesia when he was four weeks old. He was later sent to an Institution.

These three cases required only local analgesia. There was normal blood loss in each case and uterine retraction and contraction was good. The old scars were excised in both the 'repeat' cases.

UTERINE INERTIA

Caesarean Section occupies a definite place in obstetrics as a method of delivery for certain of these cases. In six of the series this was the indication.

The typical picture is one of early rupture of the membranes and vague backache which becomes intensified. The contractions are useless, irregular and extremely painful. The head is high, often occipito-posterior and badly flexed. Difficulty is experienced in passing urine and eventually repeated catheterisation is necessary. The stomach and colon become distended with subsequent vomiting and possible ketosis. The cervix remains a tight rigid ring 1½ to 2 fingers dilated and no advance occurs. After many hours with the membranes ruptured, if this state is allowed to continue the foetal heart may begin to fail, meconium may be passed and there is a definite danger of intrauterine infection of the mother and possible bronchopneumonia of the child. If this does not occur the maternal pulse rate will certainly increase.

This occurred in two of the cases not included in the appendix and gave rise to grave moments of anxiety. It can be appreciated in such cases that the likelihood of post-partum haemorrhage, pyelitis, peritonitis with subsequent ileus, intrauterine infection and pneumonia from lungs already congested and limited in their basal expansion,

must not be ignored. With all these possibilities in mind it was decided not to subject the patient to any form of anaesthesia likely to cause further embarrassment to the lungs, to interfere with intestinal peristalsis, to cause further inhibition of bladder control or to cause more impairment of uterine function in an organ which was already functioning badly. For these reasons local analgesia alone was deemed to be the anaesthetic of choice. In both cases did the babies cry at birth. They were given penicillin four-hourly, intramuscularly, for five days as a prophylaxis against possible pneumonia from intrauterine infection - both did well. The mothers were also given penicillin, 60,000 units four-hourly as a prophylaxis against uterine infection.

Case no. 19 was a suspected case and a risk both to the mother and the baby - the membranes had been ruptured for 36 hours. The baby weighed 8 lbs. In this case the local infiltration was reinforced by pentothal just before the lower segment was incised. On the tenth day the mother developed a pyrexia of 100° due to a small stitch sinus which was discharging. This healed well with dry dressings of sulphonamide and penicillin powder.

Case no. 29 was a primigravida aged 33 who had been married for ten years and was very apprehensive. She had a mild pre-eclampsia with rising blood pressure and albumen appeared in the urine after the commencement of labour.

Section was performed after 24 hours - the membranes were intact. Local infiltration alone was sufficient. The child cried at once.

In none of these cases did the condition of the mother alter during the operation. The pulse remained steady, the uterus contracted well with the minimum amount of blood loss and routine oxytocics were given.

FOETAL DISTRESS

There were four cases of foetal distress, three of which appear in the appendix. One occurred in a case (No.2) of pre-eclamptic toxaemia with high blood pressure and albuminuria. Her membranes had been punctured three and a half days previously for this reason. She developed uterine inertia and the foetal heart rate began to fail. Penicillin was commenced prior to operation to combat possible infection.

Case no. 5 was an elderly primigravida who developed uterine inertia followed by irregularity of the foetal heart and the passage of meconium-stained liquor amnii. Her membranes had ruptured 26½ hours prior to operation. She was also given penicillin prophylactically.

Case no. 8, also an elderly primigravida, had pre-eclampsia with hypertension and albuminuria. Her membranes ruptured spontaneously and the liquor was seen to be thick with meconium. The foetal heart rate was slow. She was not in labour and section was performed within half an hour.

There was one additional case which does not appear in the table and was similar to case no. 5. The infant, although bathed in meconium, was alive and cried immediately the air passages were cleared.

Resuscitation of the infant was not necessary in any of the cases and the condition of all babies was satisfactory.

Local infiltration only was used in each case. It is hardly necessary to emphasize the obvious advantages to the babies provided by this method of anaesthesia. The blood loss in each case was minimal.

PROLAPSED CORD

The three cases of prolapsed cord occurred in primigravidae. All of these were in very early labour with little dilation of the cervix, and in each one the cord was pulsating strongly. Section was performed without delay. The risk to the foetus in these cases was considerable. The condition of the babies at delivery was good.

MAL - PRESENTATION

There were seven cases of mal-presentation. These consisted of (1) a transverse lie with shoulder presentation (case no. 7); (2) a breech with extended legs occurring in a primigravida aged 37 who had been married for six years (case no. 27); (3) a breech with extended legs

occurring in a patient aged 36 who had had two miscarriages and no live child (case no. 33); (4) a breech with extended legs in a woman aged 35 who had had one miscarriage. Attempted version had failed and the baby was large (case no. 36); (5) a brow presentation admitted as an emergency after a prolonged labour (case no. 49); (6) a breech with extended legs in a patient aged 35. Attempted version had failed and the pelvis was small (case no. 55) and (7) a breech with extended legs in a patient aged 36 who had had a forceps delivery and stillbirth previously.

Of these, cases number 7 and 49 presented especial risks to both mother and foetus.

Case no. 7 was in labour on admission and the membranes were intact. It was impossible to correct the presentation so section was carried out forthwith. Pentothal was given as the lower segment was incised and the child was extracted as a breech by traction on one of its legs. It weighed 6 lbs. 9 ozs. and cried at once.

Case no. 49 was a primigravida aged 21. She had engaged her own midwife and intended having her baby at home. Labour had commenced at least 50 hours before admission and she was in a state of inertia. The urethra had been abraded by repeated catheterisations and she had pyrexia due to cystitis. The head was high and the presentation was a brow. The membranes had been ruptured for

over 50 hours and many vaginal examinations had been performed before admission. She was given penicillin, 125,000 units I.M. before section was performed and 60,000 units four-hourly after operation. Pentothal was given intravenously just as the lower uterine segment was incised. The upper lip and alveolar margin of the foetus was seen to be pressed tightly against the symphysis pubis, and in the occipito-parietal region the skull was indented by pressure from the promontory. The condition of the infant at birth was good apart from the pressure marks mentioned. It was given penicillin four-hourly from birth but subsequent culture from the area of necrosis of the lip showed a relatively penicillin-insensitive strain of staphylococcus aureus. In spite of continuous chemotherapy the child died on the fourteenth day from bronchopneumonia. The birth weight was 9 lbs. 4 ozs. The mother remained pyrexial for several days after delivery due to the coliform pyelitis. This responded to sulphonamide therapy and she made rapid progress.

BAD OBSTETRIC HISTORY

In the histories of the seven patients classified under this heading, one of the following factors predominated:- previous stillbirth, malformation of the foetus, difficult forceps deliveries, previous Caesarean

section, or a long period of unintentional sterility. Six of these cases are detailed in the appendix and of the seven cases there are two which deserve further mention, numbers 48 and 62.

In the first of these, the mother had had a still-birth ten years previously, followed by a long period of sterility mingled with fear of what might happen in a subsequent pregnancy. She was extremely apprehensive and most anxious that all should be well. During the last four weeks her blood pressure rose and she developed oedema at the 39th week. On account of this and her obstetric history it was decided to deliver her by elective Caesarean section. Operation was performed under local analgesia alone. The child weighed 8 lbs. and cried at once. This case illustrates the fact that it is possible, by a proper method of approach, to allay fear and gain full cooperation of the most apprehensive mother, so necessary when this method of anaesthesia is employed. The assurance that her baby will not be affected at all by the drug is perhaps one of the strongest arguments in gaining the woman's confidence.

Case no. 62 suffered from chronic bronchitis. She was aged 37 and though this was her third pregnancy she yet had no living children. Her first pregnancy ended in a miscarriage at the fourth month and the second produced an anencephalic foetus. This pregnancy was at term and

apparently normal but the presentation was a breech. It was obvious that everything possible should be done to procure a living child, and that the condition of the mother's chest precluded an inhalation or spinal anaesthetic. She was delivered successfully of a live infant under local infiltration, reinforced by pentothal just as the lower segment was being incised. No complication ensued and the baby cried immediately.

ACCIDENTAL HAEMORRHAGE

There were two cases of accidental haemorrhage which necessitated Caesarean section, namely no. 51 in the appendix and one other.

Case no. 51. a primigravida aged 33, was admitted two weeks before term with a raised blood pressure, albuminuria and oedema. The patient's condition responded to bed-rest during the first week, but then the blood pressure began to rise again and albumen reappeared in the urine. It was decided to induce labour surgically. Puncture of the membranes was carried out and clear liquor amnii was withdrawn. Shortly after this she had a painless red loss of approximately six ounces, accompanied by transient slowing of the foetal heart. After a latent period of 32 hours, during which the patient complained of vague backache only, further red loss and slowing of the foetal heart ensued. Caesarean section was performed without delay. The child weighed

8 lbs. 4 ozs. and cried at once. Local infiltration alone proved entirely satisfactory.

The other accidental haemorrhage in this series occurred in a primigravida, aged 38, at term, who was admitted as an emergency with raised blood pressure and albuminuria. After admission, she lost ten ounces of blood vaginally and the foetal heart rate fell. She was not in labour and the head was high. In view of her age, and the condition of the foetal heart, Caesarean section was carried out. Both mother and child made an uneventful recovery. As in the above case, only local analgesia was employed.

HEART DISEASE

There were eight cases in which heart disease complicated the pregnancy. Of these, five are minutely analysed in the appendix. Chronic Rheumatic Endocarditis was the aetiological factor in seven cases, and there was one case of interauricular septal defect. The following table shows the relative incidence of different valvular lesions encountered, and indicates the functional cardiac capacity in each group.

PATHOLOGY.	No.of cases.	DYSPNOEA		CONGES-TIVE FAILURE	AURICULAR FIBRIL-LATION.
		On slight exertion	At rest.		
Mitral Stenosis.	5	1	2	2	1
Mitral Re-gurgitation.	1	-	1	-	-
Aortic Re-gurgitation.	1	-	-	1	-
Congenital Heart disease	1	-	1	-	-
TOTALS	8	1	4	3	1

Signs of decompensation were present in all cases, taking the form of dyspnoea on slight exertion in no. 21, of dyspnoea at rest in nos. 3 and 44, and of frank congestive failure in nos. 46 and 66. One of the three unanalysed cases was of congestive cardiac failure with mitral stenosis and auricular fibrillation. The other two cases, one of mitral stenosis and one of predominating regurgitation, both fall into the second group.

In all cases only local analgesia was employed, the average weight of the infants was over seven pounds, and in no case did the patient's condition deteriorate during operation.

DIABETES

There were two cases of severe diabetes complicating

pregnancy, nos. 1 and 47. It is the practice of the writer to terminate such cases by Caesarean section under local anaesthesia at the 36th week.

Case no. 1. a young primigravida, had in addition a mild degree of pre-eclamptic toxaemia and a small round pelvis. She had had frequent attacks of hypoglycaemic coma in her antenatal period. Diabetes Mellitus was diagnosed at the age of 12 years. By the 36th week there was already evidence of some disproportion. At operation a Type III placenta praevia was discovered, although she had only slight bleeding for one day at the 33rd. week.

Case no. 47 was aged 35 years and had lost her first baby. She was treated like the above by elective section. The presentation was a breech and the child was extracted by leg traction.

Local analgesia only was employed in both cases. Blood loss was slight and the condition of the patient remained good throughout operation. Diabetes carries with it a high foetal mortality and it is well known that in preparing a diabetic for anaesthesia and operation, pre-operative care is exacting and careful stabilization is necessary. It must be realised, too, how much safer it is for the patient when she has to contend only with the alteration in metabolism accompanying the birth of the child, without the added effects of anaesthesia whether general or spinal.

PLACENTA PRAEVIA

The sixteen cases of placenta praevia in this series were all considered poor operative risks. The following table shows the incidence of the various types:

	TYPE I	TYPE II	TYPE III	TYPE IV
Number of cases.	-	2	10	4

Type I was not represented.

Of the two cases of type II, no. 22 is fully analysed in the appendix. This patient was a primigravida, aged 35, who had been married for six years. She was admitted at term as an emergency with painless vaginal bleeding amounting to five to eight ounces. After routine blood grouping and Rhesus testing she was prepared for Caesarean section and taken to theatre for pelvic examination. On gentle examination the placenta was found lying low, posteriorly, just inside the cervix which admitted one finger. There was no further loss and section was carried out immediately. The condition of the mother remained good during the operation and although blood was available in the theatre it was not required.

TYPE II

The second case was admitted with a similar history. Her Rhesus factor was negative but no antibodies were present. On examination in the theatre she was also found to have a marginal placenta praevia and section was carried out. Blood

transfusion was not necessary either before or during operation as her condition remained satisfactory.

Both cases were conducted entirely under local infiltration analgesia. The uterus contracted well in each case and there was very little bleeding during operation. Both infants cried at once.

The majority of cases were of type III. It is seen from the accompanying table that all but one presented with antepartum haemorrhage. Case no. 6 was the exception, a placenta praevia being found at pelvic examination prior to surgical induction after version for transverse lie. This patient had had the operation of myomectomy, left salpingo-oophorectomy and anterior colporraphy performed two and a half years before, and during examination several small fibroids were palpable through the vaginal vault. Section was carried out and the fibroids enucleated at the same time. Sterilisation was not performed owing to difficulty in reaching the right tube, due to adhesions. Local analgesia was used throughout. More than the usual blood loss occurred during removal of the fibroids and the pulse rate increased. On return to the ward she was given one pint of blood. Her puerperium was uneventful.

TYPE III

Cases nos. 12, 13, 41 and (a) were all suffering from

No.	Degree of shock	Presenting feature.	Transfusion			Presentation or lie.	Weight of Infant.
			Pre-operatn.	During oper.	Post oper.		
6	nil	Unstable presentatn.	-	-	Yes	Unstable.	8lbs 3ozs.
12	severe	A.P.H. 1-2pt.	Yes	Yes	Yes	V, high head	7lbs.7ozs.
13	severe	" ½ pt.	Yes	Yes	Yes	Transverse	5lbs.2ozs.
41	severe	" ½ pt.	Yes	Yes	Yes	Transvse.	5lbs.2ozs.
(a)	severe	" 1 pt.	Yes	Yes	Yes	Breech	5lbs.4ozs.
16	mod.	" ½ pt.	-	Yes	-	Vertex	6lbs.
17	mod.	" ½ pt.	-	Yes	-	Vertex	7lbs.
39	mod.	" ½ pt.	-	Yes	-	Vertex	7lbs.3ozs.
(b)	mod.	" ½ pt.	-	Yes	-	Vertex	7lbs.3ozs.
45	-	" ½ pt.	-	-	-	V.high head	6lbs.2ozs.

severe shock on admission and required blood transfusion before, during and after operation. In cases nos. 41 and (a) the infants were delivered as breeches. There were two transverse lies. Two of these mothers (nos. 12 and 41) were given further blood transfusions on the 8th and 3rd days of the puerperium, respectively, although normal blood loss occurred during operation in all cases. Local analgesia alone was used in cases nos. 12 and 41, and pentothal was given in addition in case no. 13. The infants cried immediately and in no instance was there any cause for anxiety.

Cases nos. 16, 17, 39 and (b) were suffering from a lesser degree of shock and blood transfusion was commenced in the theatre as a guard against further haemorrhage. All four were vertex presentations, blood loss during operation was minimal and the infants cried lustily on delivery. Local analgesia was reinforced with pentothal in case no. 39 which was complicated by pre-eclamptic toxaemia.

Case no. 45 was not shocked on admission and did not require blood transfusion. Section was uneventful. The two cases (a) and (b) are not detailed in the appendix.

Of the four cases of complete central placenta praevia two are included in the appendix (cases nos. 42 and 50)

TYPE IV

Case no. 42 was suffering from an extreme degree of shock on admission and her haemoglobin was found to be 46 per cent. Blood transfusion was commenced immediately and continued during Caesarean section 15 hours later when her blood pressure was 110/70 and her haemoglobin had risen to 68 per cent. Local analgesia alone was used and the condition of the patient remained satisfactory throughout. The child cried at once. A further blood transfusion was given on the third day of the puerperium to correct anaemia, although there was only the expected amount of haemorrhage during operation.

Case no. 50 had had an antepartum haemorrhage of one to two pints and on admission appeared severely shocked; her

Case No.	Presenting feature.	Degree of shock	Transfusion			Presentation.	Weight of Infant.	
			Pre-oper.	During oper.	Post-oper.		lbs.	ozs.
42.	A.P.H.1pt.	severe.	Yes	Yes	-	Vertex.	5	2
50	" 1-2pts.	Severe.	Yes	Yes	-	Vertex high hd.	5	5
(c)	" 1½pts.	Severe	Yes	Yes	Yes	Breech	6	-
(d)	" 1pt.	Severe	Yes	Yes	-	Vertex	6	2

blood pressure was unrecordable, the pulse thready and rapid. She was given two pints of blood by drip transfusion and responded well. There was no further bleeding, and at the time of section her blood pressure was 120/80 and her haemoglobin 80 per cent. Operation was performed entirely under local analgesia and the patient made an uneventful recovery.

Case no. (c) was also suffering from a severe degree of shock on admission. A transfusion of Rhesus negative Group O blood was given immediately, and after a period of four to five hours she was taken to theatre and section performed. A lively infant was delivered by leg traction.

Case no. (d) was a primigravida aged 30 who had previously been admitted as a threatened miscarriage when fourteen to sixteen weeks pregnant. Both mother and child did well.

Pelvic examination was found necessary in only five of these sixteen cases, the diagnosis being obvious, from the history and findings alone, in the other eleven cases. Such examinations are always carried out in the theatre with the patient prepared for Caesarean section if necessary. Blood is at hand and if the Rhesus test has not been done, Group O Rhesus negative blood is given if required.

PELVIC EXAMINATIONS:

In eleven cases pelvic examination had been performed in the patient's home and on admission nine of these cases were suffering from a severe degree of shock and blood loss, but in no case had the vagina been packed!

The absence of operative shock in these patients whose condition is so critical is striking. Throughout operation the colour remains good, the pulse does not alter, and the blood pressure varies hardly at all. Local analgesia effectively blocks all afferent stimuli arising in the operative field and adequate reassurance protects the patient from psychic shock. Reference is made to this subject later in this paper for it is felt that it cannot be too strongly emphasised.

PRE-ECLAMPTIC TOXAEMIA

There were two cases in which pre-eclampsia was the main indication for Caesarean section, cases nos. 9 and 15

in the appendix. Both cases were complicated by uterine inertia and disproportion.

Case no. 9 was a primigravida aged 34 years. She had been in labour for 48 hours, the membranes were intact, her blood pressure was 180/130, the urine contained albumen, and oedema of the ankles was marked. In view of the rising blood pressure, and only vague labour pains, Caesarean section was performed. The liquor was found to be heavily stained with meconium and the presentation was right occipito-posterior.

Case no. 15, a primigravida aged 28 years, was admitted with a blood pressure of 140/90, albuminuria and oedema of the ankles. The head was free. After a labour lasting 31 hours the membranes were still intact and Caesarean section was performed on account of the rising blood pressure and non-engagement of the head.

Operation was performed under local analgesia in both cases, and both infants cried immediately. The patients made uneventful recoveries.

LOCAL

ANALGESIA

IN

CAESAREAN SECTION

--oOo--

The advantages which local infiltration offers to the patient undergoing Caesarean section are so striking that it is surprising the method has not been more widely adopted for this reason alone. Add to this the indisputable fact that asphyxia of the infant is not encountered if pre-operative medication is omitted and the answer is even more difficult to find.

CONTRAINDICATIONS

The literature is significantly lacking in reports of contraindications to the use of local analgesia. The fact that the operative field is rendered painless without loss of consciousness will in itself determine some of the arguments for and against its use. It is often argued that it cannot be used in the very apprehensive patient; this, no doubt is true if the patient is allowed to remain apprehensive, but in the experience of the writer, no woman has been encountered whose fear could not be allayed by the correct approach, and therefore complete cooperation obtained. It is said to be contraindicated when the patient is under treatment with sulphonamides, owing to inactivation of the analgesic.(48) This is not substantiated by the writer's experience.(48) Injection through septic areas and scar tissue as examples of contraindications to its use in the operation of lower segment Caesarean section seem hardly applicable in the ordinary way. In the writer's opinion

there are no contraindications apart from the obvious inadvisibility of injecting into an area of sepsis.

DANGERS

Immediate toxic effects leading to collapse have been reported from time to time, chiefly when cocaine has been employed. Toxic symptoms of overdosage, such as excitement, restlessness, rapid and deep respiration, dilated pupils and rapid feeble pulse occur rarely with

IDIOSYNCRASY: procaine, nupercaine, amethocaine and other similar compounds, but were not uncommon when cocaine was extensively employed, leading in not a few cases to convulsions, coma and death. Langton Hewer[48] has not encountered individual idiosyncrasy to the newer drugs, but Maxon[86] and Austet[87] have both reported instances when using procaine. Personal experience with the use of procaine in the 98 operations of Caesarean section and over 200 vaginal deliveries by forceps, is in agreement with Hewer.

Inadvertent intravenous injection of drugs with its attendant dangers should not arise if reasonable care is exercised; the addition of adrenaline to the

INTRAVENOUS INJECTION: local solution renders this accident more remote by local vascular constriction, in addition to prolonging its action. It has been stated that this very occasionally leads to ventricular fibrillation.

LOCAL IRRITATION:

Local tissue irritation should not occur with the preparations now available, though extensive sloughing in debilitated subjects was noted by Abel,[88] and Slot[89] reported one death from this cause. No instance occurred in the present series.

ADVANTAGES

The criteria of the ideal anaesthetic for Caesarean Section are:-

1) It should have no adverse effect on the mother.
2) It should have no adverse effect on the foetus.
3) It should be an efficient analgesic.
4) It should be applicable to every case, with or without co-existing organic disease.
5) It should not interfere with uterine function.
6) It should protect against excess haemorrhage during operation.
7) It should protect the patient from shock and circulatory failure.
8) It should cause minimal disturbance of respiratory function.
9) It should cause minimal disturbance of metabolism.
10) It should not interfere with peristalsis or normal bladder function.
11) It should encourage quiet breathing and relaxation of abdominal musculature.

12) It should be free from unpleasantness to the patient both before and after operation.

13) It should not predispose to post-operative complications.

14) It should afford ease of administration and portability.

Local analgesia either alone or combined with pentothal fulfils each of these conditions in the opinion of the writer, provided that the pentothal, if found necessary, is withheld till the incision of the lower uterine segment is made, and then only given in sufficient quantity to render the mother unconscious during extraction of the infant.

There is no doubt that local infiltration is the least toxic of all methods of anaesthesia if properly carried out although Bortone,[90] in 1932, reviewing the immediate mortality in 50,000 consecutive and unrelated operations both under local and general anaesthesia reported that in the former group it was more than twice that in the latter group. Others hold that there is no difference in the operative mortality, whilst Finsterer[59] found that the mortality rate from circulatory failure or cardiac failure in the first three days following abdominal operation in a series of 5,000 cases was only 0.08 per cent as compared with 2.2 per cent in a similar series under general anaesthesia. Farr[91] with his extensive experience in the use of local analgesia for all forms of operations is of the opinion that no other method carries so few risks. Marshall, after ten years experience with

TOXICITY:

this method of anaesthesia, is still of the opinion that local analgesia is pre-eminently the anaesthetic for the operation of lower uterine segment Caesarean section.(49)

Most authorities agree that local anaesthesia is vastly superior to any other method in diminishing operative shock.(42)(62)(91)(92)(93)

SHOCK: Nerve block obtained either by local infiltration or by intrathecal injection completely protects the Central Nervous System from noxious afferent stimuli, whilst inhalation anaesthesia of sufficient degree to produce synaptic shock would endanger the vital medullary centres. However, Beecher(94) has recently expressed the opinion that cyclopropane is of particular use in shocked cases, a view shared by Hershey and Rowenstine(95) who refer to its use in cases blanched by haemorrhage.

APPLICABILITY: In the preceding analysis of the 'poor risk' cases of the writer's series, reference has already been made to the wide applicability of local analgesia for the operation of Caesarean section. Heart disease with all degrees of decompensation, pulmonary disease both acute and chronic, diabetes mellitus, the toxaemias of pregnancy, renal disease, general debility, shock and severe haemorrhage have frequently to be considered, and there need be no fear of adding to their seriousness. The dangers of induction inherent in inhalation anaesthesia are avoided, there is no interference with the normal respiratory processes, and there is no danger of the inhalation

of vomit by an unconscious patient. Moreover, during operation neither the patient nor the foetus is subjected to the continuous administration of a depressant drug; cell metabolism continues normally throughout the body except in the actual area of infiltration, and the liver and kidneys are unaffected. If of less importance to the patient, but none the less important to the surgeon, local analgesia dispenses with the necessity for the presence of a trained anaesthetist, is simple to administer and does not entail elaborate apparatus; closure of the abdomen is easy and uneventful by virtue of the normal breathing and relaxation of the abdominal muscles.

Local infiltration of the abdominal wall has no effect on the involuntary musculature of the patient. This can be said of no other method of anaesthesia, for general anaesthesia affects all tissues of the body, and spinal anaesthesia affects both medullated and autonomic nerve fibres.

EFFECT ON PLAIN MUSCLE:

Cardiac function, vascular tone, peristalsis and uterine retraction and contraction are preserved throughout. Severe postpartum haemorrhage, from uterine atony, should not occur; operative haemorrhage is minimal, abdominal distension, paralytic ileus or peritonitis has not been encountered in the writer's series. Abdominal distension occurred only once in Marshall's series of over 30 cases (1939), and Finsterer (59) considered ileus an unusual complication of abdominal

surgery under local analgesia.

That the patient under local analgesia is conscious of the operator working is no deterrent to the method, and in fact causes her no discomfort. It necessitates gentle handling of the tissue which in itself is one of the factors responsible for the lack of operative shock and is a pre-requisite for rapid healing of the would.

COMFORT OF THE PATIENT:

Local analgesia eliminates the necessity for speed, thus preventing accidents and errors of judgment. The patient is awake and is thus protected from injury which might occur in the rough handling of an unconscious patient. If the patient is in labour she will continue to feel these pains till after delivery of the child, but if this were considered a disadvantage to local analgesia, then every woman in normal labour should be given a general or spinal anaesthetic! Adequate explanation of the method relieves the patient of apprehension. The post-operative period is completely free from nausea, vomiting, headache and other sequelae of spinal and general anaesthesia; starvation is unnecessary either before or after operation and the patient may be refreshed by a cup of tea on return to the ward. There is no better testimonial to this method than the assurance, by a patient who has had a general anaesthetic for previous section, that local analgesia is preferable in every way. In the twelve 'repeat' sections in this series, this has been the

experience of the writer - nine of these had general anaesthesia and three had spinal analgesia. It is not unnatural that the mother likes to see her infant and to know its sex at the same time as her medical attendants, and to feel that her body is whole.

Great enthusiasm for this method is shown by the nursing staff whose duties are considerably lightened and this is reflected in the general atmosphere of cheerfulness which pervades the ward.

Although Minnitt and Gillies[42½] state that local analgesia does not abolish pulmonary complications, there is no doubt that they occur rarely. By its use three factors in the production of these complications are avoided, namely irritation of the pulmonary mucous membrane, depression of the respiratory centre, and interference with intercostal nerves. Finsterer[59] found the incidence of pneumonia to be 0.24 per cent as compared to 1.31 per cent after abdominal operations under general anaesthesia, and noted that such complications as did occur were, in the main, of a benign nature.

POST-OPERATIVE COMPLICATIONS:

The writer in an attempt to show the incidence of post-operative complications following general anaesthesia in a series of 103 consecutive Caesarean sections performed between the years 1944 and 1946, has prepared the following

ST. ALFEGE'S HOSPITAL, LONDON.
1944 - 1946

Anaesthetic	Number of cases.	Foetal Asphyxia.	Operative haemorrhage.		
			Slight.	Moderate.	Free & severe
Gas, O_2 & Ether.	25	6	5	12	8
Gas, O_2, Ether, Trilene	2	-	-	1	1
Gas, O_2, Trilene.	6	-	1	2	3
Spinal, Gas, O_2.	3	-	-	3	-
G.A.(unspecified)	38	3	3	32	3
G.A. TOTALS	74	9	9	50	15

Series of 74.	Severe foetal asphyx.	Pyrexia 100° or over.	Pulmonary complicns.	Vomitg. & Distension	Ileus.	Retention urine
Number of Cases	9	42	15	2	1	-
Percentage	8.7%	48%	14.6%	1.94%	0.97%	

Synopsis of Post-operative pulmonary complications

Bronchitis.	8.	7.76%
Pneumonia	3.	2.9 %
Collapse	2	1.94%
Abscess	1	.97%
Embolism	1	.97%
TOTAL	15	14.6 %

Synopsis of causes of post-operative pyrexia.

Pulmonary disease	15.
Puerperal sepsis	3.
Urinary infection	5
Wound sepsis	2
Breast abscess	1
Incompatible Blood Transfusion	1
Unrecorded	15
TOTAL	42

Note: Most of the unrecorded group of cases of post-operative pyrexia, had pyrexia of 24 to 48 hours duration only, and had

had moderate or severe operative haemorrhage.

Foetal and Maternal Mortality.		
Stillbirths	0	
Neonatal deaths.	6	5.8%
Maternal death (paralytic ileus)	1	0.97%

Causes of neonatal deaths	
Prematurity	1
Erythroblastosis.	2
Asphyxia and atelectasis	3

tables. Out of the total of 103 operations only 74 case papers were available and in order to err on the conservative side, all percentages are based on the total figure, it being assumed that no complications arose in the remaining 29 cases. The foetal asphyxia rate appears low but the records referred only to those cases in which the infant nearly died. Oxygen, carbon dioxide and oxygen mixture and lobeline appear to have been employed in nearly every delivery.

In the writer's series there were no maternal deaths no stillbirths and no postoperative complications. There was one neonatal death, to which reference has already been made, giving a foetal mortality of 1.02 per cent.

STRATEGY.

It is the practice of the writer to inform each patient personally that she will be delivered by Caesarean Section, at the same time attempting to gain her confidence. The procedure is considered to be equally as important as the operation itself. The fact of having a baby by operation often causes a great shock to many mothers and any indiscretion at this point may instil a fear which could be avoided. For many patients the idea of a mask being placed over the face to put them to sleep is more disturbing than the operation. The remark that "you won't be put to sleep with a mask over your face" brings a sigh of relief in many cases. Following this statement an explanation is given

that if she were "put to sleep" the baby would also be born under the influence of the anaesthetic and might have difficulty in breathing. Most women are reasonable and extremely anxious that their baby should not be harmed in any way and usually reply "do whatever you think is best, Doctor, as long as the baby is allright". She is then told that she will feel two or three pin pricks in her abdomen but nothing more, although she will be aware of the movements of the operator.

If she is in labour she will be told that the labour pains will not be abolished, and should she wish she may continue to use the Minnitt apparatus. Finally, it is explained that if she desires, she may have an injection into her arm to put her to sleep for a few moments as the baby is being born, after which she will wake up during completion of the operation.

In elective Caesarean sections the abdomen is prepared on the day before and again on the morning of operation. After the vulval and pubic hair has been shaved, the PREPARATION: area is washed with ether soap, saline and dried with methylated ether. A sterile dressing is applied. Next day the preparation is repeated and in addition the area is painted with Bonney's blue, and a catheter inserted in the bladder. Rhesus and ABO blood grouping are carried out if not already known.

Atropine sulphate, gr. 1/100, is injected subcutaneously one hour before operation.

Dark glasses are given to the patient to protect her from

the glare of the light and any reflection of the operation field.

Perfect cooperation between the theatre staff and the ward staff is essential. They should remember that the patient is awake and that complete silence in the handling

THEATRE: of trolleys and instruments is imperative. Talking should be reduced to a minimum.

The operating table is covered with a thick sorbo mattress or with four soft jaconet pillows, and the patient is told to make herself quite comfortable. If she wishes to talk during the operation she is engaged in conversation only by the ward Sister who sits at her head, or by the operator. She is allowed fluids by mouth as she wishes.

The requisite blood or Group O Rhesus negative blood is kept in readiness.

The anaesthetic is ½ per cent procaine hydrochloride (B.P.1932). Three hundred c.cs. is freshly prepared and to this is added thirty minims of adrenaline 1/1000.

ANAESTHETIC: A Dunn's syringe is used for the injection of this. Preparations are made for the giving of pentothal should this be found necessary. A skilled anaesthetist is always available for this purpose.

OPERATION

The catheter is released, the bladder emptied and allowed to drain freely during the operation. The abdomen is painted

with Bonney's blue and sterile towels applied in the usual manner.

Using a fine hypodermic needle two intradermal wheals are raised one at the junction of the upper and middle third, and one at the junction of the middle and lower third of a line joining the umbilicus to the symphysis pubis. With a four-inch malleable needle these are joined and the skin and subcutaneous tissues infiltrated to a distance of 2½ inches on either side of the mid line. The point of the needle is kept moving and injection is only carried out on withdrawal, approximately eighty c.cs. of the solution being required. Special care is taken to inject well over the mons veneris. A mid-line subumbilical incision is made down to the rectus sheath. Bleeding points are secured by pressure forceps.

INFILTRATION:

Each rectus sheath is pierced one inch lateral to the mid-line and the spaces distended with solution. The prevesical fat is infiltrated and approximately sixty ccs. are used for these two manoeuvres. The rectus sheath is then incised and the peritoneum opened.

The area is packed off loosely with a roll of gauze wrung out of warm saline. Occasionally it is necessary to instruct the patient to take deep breaths to facilitate this process. A self-retaining retractor is not used, any necessary retraction during the next stage of the operation is obtained satisfactorily by the use of a

LOWER SEGMENT SECTION

small hernial retractor or the assistant's finger. The loose peritoneum over the lower segment is incised transversely by a curved incision extending towards the broad ligaments and the flaps are pushed up and down by gauze dissection. Extreme gentleness is used throughout. It is at this point that reinforcement by pentothal is considered (vide infra). The lower segment is opened by a curved transverse incision carried laterally on either side by means of a bistoury. The right hand is used to deliver the head if the presentation is a vertex, otherwise delivery is carried out by leg traction. The cord is clamped and cut and the child handed to a waiting nurse, gloved and gowned for the occasion, who shows it to the mother before placing it in a warmed cot.

Either .5 mgs. of ergometrine, or 5 units of pitocin is injected routinely directly into the uterine muscle - both being equally effective in the writer's experience.

As soon as the child is delivered the uterus usually contracts well and blood loss is very slight. The edges of the wound are secured by Allis's forceps and the placenta is expelled by cord traction and fundal pressure. The lower segment is closed in two layers by continuous sutures of catgut (nos. 1 and 2.) and the loose peritoneum is sutured with no. O. catgut in a continuous layer. The gauze roll is removed, the abdomen swabbed free of blood and clot, the swabs are checked and the parietal peritoneum closed with a continuous catgut suture (no. 1.) Three tension sutures with rubber

guards are inserted through the skin and beneath the rectus sheath. The rectus sheath is closed with no. 2 catgut and the skin edges held together with clips. The tension sutures are tied loosely. The stitch line is painted with Bonney's blue and a thin gauze dressing applied and fixed at the corners with adhesive tape. No further dressing is used. Fundal pressure promotes free drainage by expelling blood clot from the vagina.

If the patient is conscious throughout operation, Heroin gr. 1/6 is given after the placenta is expressed, or after consciousness has been regained in those cases who are given pentothal.

While the operator writes the notes the patient returns to her room where a tray of tea and toast awaits her and usually her husband with whom she is anxious to converse about her baby.

The writer's indications for reinforcement with pentothal are (1) a restless patient, (2) a retraction ring, (3) to assist extraction of a complex presentation,

PENTOTHAL: (4) when difficulty is experienced in delivery of a head. The minimal amount is given - 0.25 to 0.50 gm. being sufficient to enable the extraction to be completed, and the mother is allowed to regain consciousness before completion of the operation.

POST-OPERATIVE ROUTINE

(1) Massage, exercises and deep breathing are commenced before operation if possible, and if not then immediately afterwards. Instruction is given by a trained masseuse.

(2) Heroin gr. 1/6. is given on the first and second evenings after operation.

(3) Vitamin C, 200 mgms. is given daily for fourteen days.

(4) Bemax is given daily.

(5) Fersolate, tabs. ii, is given three times daily for fourteen days.

(6) Magnesium Hydroxide Emulsion, 1½ ounces three times daily is given on the third - fourth days till the bowels open and thereafter as required.

(7) The patient is treated as a normal delivery and encouraged to move around in bed.

(8) Skin clips are removed on the sixth day.

(9) Tension sutures are removed on the eighth day.

C O N C L U S I O N

The writer has attempted to give a fair criticism of all methods of anaesthesia and whilst acknowledging the superiority of spinal over inhalation methods, there remains no doubt in her mind that local analgesia is the anaesthetic 'par excellence' for the operation of lower segment Caesarean Section.

The time has now come when the public may be assured with all honesty that local analgesia is as painless as other methods, and that the tradition that this operation presupposes loss of consciousness is obsolete.

Local analgesia is not a time-consuming procedure, and even if it were, the surgeon's comfort is never more important than the life of the mother and her child. In 98 consecutive Caesarean sections, from the moment of inserting the needle into the abdominal wall till the extraction of the child never more than twenty-five minutes have elapsed. The surgeon who advances the argument that no anaesthetist should interfere with the surgical field, should learn to regard the local infiltration as part of his duties - the initial stage of the operation, not a prelude to it.

The false idea of its anaesthetic value that is engendered in the minds of surgeons and public alike, by poor attention to detail and heavy-handedness of the operation is to be deplored. A failure to appreciate how simple is the

technique of infiltration and how important the operator's approach to the patient both before and during operation, have undoubtedly helped to cast disfavour on the method.

It is to these misconceptions alone, that is due the present position of local analgesia in the operation of Caesarean section.

--oOo--

Therefore to him that knoweth to do good, and doeth it not, to him it is sin.

James IV. v 17.

--oOo--

A N A L Y S I S

OF

SIXTY SIX

of

A Total Series of 98 Sections

Performed between the Years 1943 and 1948

at

Paddington Hospital, London
1943 - 1946

and

St. Alfege's Hospital, London
1947 - 1948

No.	B or E	Reg. No.	Age	Grav.	Mat.	Indication	Rh.	Hb% at opn	B.P. at opn.	Urine	Oed.
1*	B	738	19	I	36	Severe Diabetic Small Pelvis Toxaemia Plac. Praevia 3	+	88	150/95	Alb. -ve Sugar +ve	sl.
2*	B	613	30	I	38	Inertia. Toxaemia. Foetal Distress	+	80	150/90	Alb. +	++
3*	B	649	32	I	38	Congenital heart Dyspnoea. Small Outlet.	+	82	105/70	nil.	nil.
4	B	672	24	I	40	Contracted Pelvis (rachitic) Occiput Posterior Disproportion	+	84	126/80	nil.	nil.
5*	B	689	37	I	40	Inertia.High Head Foetal Distress Slight Outlet Contraction.	+	80	132/90	nil.	nil.
6*	B	693	39	III	40	Plac. Praevia 3. Hydramnios. Unstable Presentation.	+	80	150/90	nil.	nil.
7*	E	811	35	II	40	Transverse Lie. Shoulder Presnt.	+	74	110/70	nil.	nil.
8*	B	826	37	I	40	Toxaemia. Age. Foetal Distress. High Head.	+	84	150/100	Alb. ++	++
9*	B	830	34	I	40	Toxaemia. Inertia. Disproportion 1.sto R.O.P.	+	80	180/130	Alb. ++	nil.

* Indicates Bad Risk.

Duratn. of Labour	Membranes	Type of Section	Disease of Mother	Result M	Result C	Remarks
not in labour	int.	elect.	Diabetes Mellitus	A	A	Admitted 34th. week with high B.P., albuminuria, swelling of ankles. Responded to rest.
53½hrs.	3½dys A.R.M	In labour	nil.	A	A	Admitted with albuminuria and high B.P. 'suspect' given Penicillin prophylactically.
38 hrs.	rupt. 12hrs	In labour	Congital Heart Disease	A	A	Dyspnoea at rest. Interauricular septal defect. Penicillin prophylactically for 7 days.
not in labour	int.	elect.	nil.	A	A	Uneventful recovery.
vague pains 72 hrs.	rupt. 26½hr	In labour	nil.	A	A	Foetal heart irregular - child passing meconium. Extended head. Penicillin prophylactically.
not in labour	int.	elect.	Myomectomy. Salpingo-oophorec. Ant.Colp. 1945	A	A	Two previous normal deliveries. Placenta felt through cervix after version, prior to A.R.M. Section performed forthwith. 3 fibroids found at level of lower segment - enucleated. Not sterilised owing to adhesions. Transfusion blood 1 pint on return to ward. B.P.=145/100 at end of opn. Pulse rapid.
6 hrs.	int.	In labour	nil.	A	A	First child - 5lb.14oz. 'Long labour' spont. delivery.
not in labour	rupt. ½hr.	not in labour	nil.	A	A	Spont. rupture of membranes. No pains. Meconium ++. Foetal heart slowing. Plac. Praevia IV at operation.
48 hrs.	int.	In labour	nil.	A	A	Pre-eclamptic Toxaemia - vague pains. B.P. rising. Urine blood-stained. Meconium liquor at section. Right Occipito-posterio r

Not feasible in flat pelves

No.	B or E	Reg. No.	Age	Grav.	Mat.	Indication	Rh.	Hb% at opn	B.P. at opn.	Urine	Oed.
10	B	861	20	I	40	Flat Rachitic Pelvis. R.O.P. Disproportion	+	84	140/90	nil.	nil.
11	B	433	29	II	40	Contracted Pelvis High Head.	+	80	130/80	nil.	nil.
12*	E	434	38	I	40	A.P.H. ?30 oz. Floating Head. Plac. Praevia 3.	+	60	100/50	nil.	nil.
13*	B	427	23	II	36	Mobile Foetus. A.P.H. 10 oz. Transverse Lie. Foetal Distress. Plac. Praevia 3.	+	78	126/80	nil.	nil.
14	B	376	35	I	39	Disproportion. Small Pelvis	+	82	120/90	nil.	nil.
15*	E	453	28	I	40	Toxaemia. Disproportion. Inertia.	+	80	140/90	Alb. +	+
16*	E	283	31	IV	40	A.P.H. 8oz. Plac. Praevia 3.	+	52	110/60	nil.	nil.
17*	B	303	26	II (1MC)	36	A.P.H. 8 oz. Plac. Praevia 3.	-ve	74	112/68	nil.	nil.
18	B	308	28	III	40	Generally Contracted Rachitic pelvis.	+	68	142/80	nil.	nil.
19*	B	362	26	II (1MC)	40	Inertia. Disproportion.	+	64	134/90	nil.	nil.

Duratn. of Labour	Membranes	Type of Section	Disease of Mother	Result M	Result C	Remarks
Trial 21hrs. 30min.	int.	In labour	nil.	A	A	Low grade pyrexia on admission. B.Coli Cystitis, treated with Sulphathiazole 18gms.
14½hrs. Trial	rupt.	In labour	nil.	A	A	Previous Stillbirth - Forceps Delivery - 7lb. 9oz.
not in labour	int.	not in labour	nil.	A	A	Admitted with history of losing 1-2 pints. Trickle when seen. Foetal heart heard. Exsanguanated. Blood transfusion before, during and after L.U.S.C.S. 3 pints in all. Two S.W.S. in skin 12th. day. No chemotherapy needed
vague backache 24hrs.	int.	? in labour	nil.	A	A	Blood transfusion during opn., 2 pints. Foetal heart irregular. Head delivered through placenta on ant. wall and lower segment.
28hrs. Trial	rupt. 28hrs.	In labour	nil.	A	A	Trial labour - Head high - L.O.L.
30hrs. 50min.	int.	In labour	nil.	A.	A	Trial labour - Rising B.P.
not in labour	int.	not in labour	nil.	A	A	Condition poor on admission. Transfused during section.
not in labour	int.	not in labour	nil.	A	A	Condition fair. Transfused during section.
not in labour	int.	elect.	nil.	A	A	Repeat 3rd. Caesarean section. Not sterilised - previous child stillborn.
32hrs.	rupt. 36hrs.	In labour	nil.	A	A	One previous miscarriage.

No.	B or E	Reg. No.	Age	Grav.	Mat.	Indication	Fh.	Hb% at opn	B.P. at opn.	Urine	Oed.
20	B	367	28	I	40	Contracted Pelvis Disproportion.	+	84	128/78	nil.	nil.
21*	B	499	35	III	40	Contracted Pelvis	+	98	144/90	nil.	nil.
22*	E	565	35	I	40	A.P.H. 5 oz. Plac. Praevia 2.	+	84	140/88	nil.	nil,
23	B	584	38	II	40	Contracted Pelvis	+	74	130/76	nil.	nil.
24	B	1	30	I	40	Contracted Pelvis Free Head.	+	80	130/80	nil.	nil.
25	B	2	37	I	40	High Head. Fibroids.	+	85	140/80	nil.	nil.
26	B	3	31	I	40	Contracted Pelvis Poor Flexion of Head.	+	80	130/75	nil.	nil.
27	E	4	37	I	40	Breech. Failed Version.		76	135/70	nil.	nil.
28	B	5	26	I	40	Flat Pelvis. Head Free.		72	130/65	nil.	nil.
29*	B	6	33	I	40	Toxaemia. Inertia.	+	78	180/110	Alb. +	+
30	B	7	31	II	40	Contracted Pelvis	+	80	140/40	nil.	nil.
31	B	8	36	I	40	R.O.P. Extended Head. Elderly Primigd.		80	135/85	nil.	nil.

Duratn. of Labour	Membranes	Type of Section	Disease of Mother	Result M	Result C	Remarks
24hrs.	int.	In labour	Bronch. Chronic	A	A	Large baby - 10lb. 5oz.
not in labour	int.	elect.	Mitral Stenosis Rheumat. Endocard	A	A	Sterilisation carried out. Repeat 3rd. section.
not in labour	int.	not in labour	nil.	A	A	General condition good. Head high. Married 6yrs. No children.
7hrs. Trial	int.	In labour	nil.	A	A	Short Trial - Repeat section.
8hrs. Trial	int.	In labour	nil.	A	A	Short Trial.
not in labour	int.	not in labour	nil.	A	A	Fibroids enucleated after extraction of child. Pentothal given for this. ?
20hrs. Trial	rupt. 4hrs.	In labour	nil.	A	A	Satisfactory.
not in labour	int.	elect.	nil.	A	A	Married 6 years. Unintentional sterility. Pregnant following Lipiodol Histogram.
10hrs. Trial	rupt. 2hrs.	In labour	nil.	A	A	Satisfactory.
24hrs.	int.	In labour	nil.	A	A	Pre-eclamptic Toxaemia - rising B.P. Unintentional sterility.
not in labour	int.	elect.	nil.	A	A	Satisfactory. Repeat 2nd. section
24hrs.	int.	In labour	nil.	A	A	Married 12yrs. Unintentional sterility.

No.	B or E	Reg. No.	Age	Grav.	Mat.	Indication	Rh.	Hb% at opn	B.P. at opn.	Urine	Oed.
32	B	9	39	IV (3MC)	40	Contracted Pelvis High Head.	+	74	140/80	nil.	nil.
33	B	10	36	III (2MC)	40	Breech with Extended legs.		80	130/85	nil.	nil.
34*	B	11	40	II	40	Contracted Pelvis		78	140/80	nil.	nil.
35	B	12	40	II	40	Contracted Outlet	+	80	140/75	nil.	nil.
36	B	13	35	1MC	40	Breech. Failed Version. Age.		88	130/80	nil.	nil.
37	E	14	20	II	40	Generally Contd. Rachitic Pelvis.		80	130/90	nil.	nil.
38	B	15	28	II	40	Contracted Pelvis Marked Outlet Contraction.		86	120/70	nil.	nil.
39*	B	914	37	I	39	A.P.H. 10oz. Plac. Praevia 3. Age. Toxaemia.	+	68	130/80	Alb. ++	+
40	B	5683	38	I	38	Flat Pelvis.	+	85	130/88	nil.	nil.
41*	E	5319	22	II	36	A.P.H. 10oz. Plac. Praevia 3. Transverse Lie.	+	70	130/70	nil.	nil.

No.	B or E	Reg. No.	Age	Grav.	Mat.	Indication	Rh.	Hb% at opn	B.P. at opn.	Urine	Oed.
42*	B	879	24	II	36	A.P.H. 20oz. Plac. Praevia 4.	-ve	68	110/70	nil.	nil.
43*	B	1535	34	I	38	Contracted Pelvis (rachitic) Toxaemia. High Head.	+	84	140/110	Alb. +	nil.
44*	B	209	26	III	38	Mitral Stenosis. Sl. Dyspnoea at rest.	+	78	120/80	nil.	nil.
45*	B	5509	39	III	38	A.P.H. 12oz. Plac. Praevia 3. High Head.	+	76	118/76	nil.	nil.
46*	B	468	35	I	38	Mitral Stenosis. Age. Cong. Heart Failure.	+	70	120/80	Alb. +	+
47*	B	2259	35	II	36	Diabetes Mellitus.	+	80	130/90	nil.	nil.
48*	B	2286	34	II	40	Bad Obst. Hist. Toxaemia.	+	70	150/98	Alb. ++	+
49*	E	5531	21	I	40	Disproportion. Small Round Pelvis. Inertia. Brow Presentation.	+	78	130/80	nil.	nil.
50*	E	16	40	II	35	A.P.H. 1-2 pints. Plac. Praevia 4. High Head.	+	80	120/80	nil.	nil.

Duratn. of Labour	Membranes	Type of Section	Disease of Mother	Result M	Result C	Remarks
not in labour	int.	elect.	nil.	A	A	On admission Hb.=46%, shocked +. Blood transfusion given and contd. In theatre 15hrs. later. Further 2 pints given on third day. Hb.=76% on discharge.
18½hrs. Trial	rupt. 27hrs.	In labour	Rickets at 3 yrs.	A	A	Admitted with Pre-eclamptic Toxaemia. Labour spontaneous. Trial.
not in labour	int.	elect.	Rheum. Mitral Stenosis	A	A	Mode of delivery decided early in pregnancy when signs of decompensation were noted. Sterilised
not in labour	int.	elect.	nil.	A	A	Condition good on admission. No Blood transfusion required.
not in lab-our	int.	elect.	Rheum. Mitral Stenosis. Congest. Failure	A	A	Chr. Rheumatic Endocarditis, decompensated - treated with digitalis and diuretin. Admitted 26th. wk. for supervision. Congestive failure increasing. Oxygen throughout section. Sterilised
not in labour.	rupt. spont. 2hrs. preop.	elect.	Diabetes Mellitus	A	A	Hypoglycaemic coma day after opn. Recovered satisfactorily.
not in labour	int.	elect.	nil.	A	A	Previous stillbirth 12 yrs. ago. Pre-eclamptic Toxaemia. Satis.
60hrs.	rupt. 33hrs.	In labour	Pyelitis	A	A	Emergency case of uterine inertia and brow presentation - urethra abraded by repeated catheterisation - febrile. Satisfactory recovery.
not in labour	int.	elect.	nil.	A	A	Shocked on admission - rapid pulse, low B.P. Transfusion 2 pints blood. Responded well. No further loss. Previous Forceps.

No.	B or E	Reg. No.	Age	Grav.	Mat.	Indication	Rh.	Hb% at opn	B.P. at opn.	Urine	Oed.
51*	B	17	33	I	40	Toxaemia. Foetal Distress. A.P.H. 6oz. Inertia.	+	92	150/110	Alb +	+
52	B	18	32	I	40	Contracted Pelvis Free Head. Disproportion.	+	86	140/90	nil.	nil.
53	B	19	38	I	40	Disproportion. Fibroids.	+	80	135/85	nil.	nil.
54	B	20	31	I	40	Contracted Brim. R.O.P. Inertia.	+	84	130/80	nil.	nil.
55	B	21	35	I	40	Breech-Extended legs. Failed Version. Small Pelvis. Free Breech.	+	92	140/80	nil.	nil.
56	B	22	23	I	40	Flat Pelvis. Disproportion. Free Head.	+	86	120/70	nil.	nil.
57	B	23	29	II	40	Contracted Pelvis	-ve	90	135/80	nil.	nil.
58	E	24	19	II	40	Rachitic Pelvis. Free Head.	+	80	130/70	nil.	nil.
59	B	25	34	II	40	Contracted Outlet		84	135/75	nil.	nil.
60	B	26	38	III (2MC)	40	Disproportion 1st Inertia.	+	88	150/80	nil.	nil.
61	B	27	41	II	40	High Head. Disproportion. Bad Obst. Hist.	+	90	155/90	nil.	nil.

Duratn. of Labour	Membranes	Type of Section	Disease of Mother	Result M	Result C	Remarks
not in labour	rupt. 32hrs.	not in labour	nil.	A	A	Painless bleeding after surgical induction. Foetal heart slowed. No pains after 32 hrs. Rigor 5th. day - responded to treatment.
6hrs. Trial	rupt. 2hrs.	In labour	nil.	A	A	Short trial labour. Disproportion. Puerperium uneventful.
not in labour	int.	elect.	nil.	A	A	Fibroid in lower segment in region of line of incision. Enucleated after section.
12hrs. Trial	rupt. 4hrs.	In labour	nil.	A	A	Satisfactory puerperium.
not in labour	int.	elect.	nil.	A	A	Married 5 yrs. Unintentional sterility.
10hrs. Trial	rupt. 5hrs.	In labour	nil.	A	A	Uneventful puerperium.
2hrs.	int.	elect. in labour	nil.	A	A	Previous stillbirth Forceps delivery. Rh-ve, no antibodies
4hrs.	int.	In labour	Rickets infancy	A	A	Seen first time in labour. Repeat section. Mentally poor.
2hrs.	int.	elect.	nil.	A	A	Repeat section in early labour
36hrs.	int.	In labour	Chronic Bronch.	A	A	Married 6 yrs. 2 miscarriages. Very apprehensive and anxious.
6hrs.	int.	elect. in labour	nil.	A	A	First seen in labour. Previous stillbirth - forceps 14yrs. ago

No.	B or E	Reg. No.	Age	Grav.	Mat.	Indication	Rh.	Hb% at opn	B.P. at opn.	Urine	Oed.
62*	B	28	37	III (1MC)	40	Breech - Extended legs. Bad Obst. Hist.	+	92	145/80	nil.	nil.
63	B	29	36	I	40	Breech - Extended legs.	+	86	140/70	nil.	nil.
64	B	30	20	I	40	Generally Contracted Pelvis. Disproportion.	+	88	110/70	nil.	nil.
65	E	31	39	I	40	Contracted Pelvis (rachitic)	+	80	130/80	nil.	nil.
66*	B	32	24	I	40	Aortic Incompetence. Dyspnoea in labour.	+	86	140/60	nil.	nil.

Duratn. of Labour	Membranes	Type of Section	Disease of Mother	Result M	Result C	Remarks
2hrs.	int.	elect. in labour	Chronic Bronch.	A	A	Apprehensive. No live children. 1 miscarriage, and one anencephalic foetus previously.
3hrs.	int.	In labour	nil.	A	A	First seen in labour. Married 11yrs. Unintentional sterility. Treated - lipiodal salpingogram
18hrs. Trial	rupt. 12hrs	In labour	nil.	A	A	Uneventful puerperium.
10hrs.	int.	In labour	nil.	A	A	Admitted in labour as emergency 1st. child adopted - illegitimate.
4hrs.	int.	In labour	Rheum. Heart Disease	A	A	Became dyspnoeic in 1st. stage, and cyanosed. Section performed with patient semi-recumbent. Convalescence good.

Amt. of Local	Pentothal	Time for opn.	A.[illegible].H.	I.P.H.	P.P.H.	Pitoc. 5units	Ergom. 0.5m.m	Pyrexia Onset	Pyrexia Degree
[illegible]0cc	-	50M.	-	sl.	sl.	+	+	-	-
145cc	-	45M.	-	sl.	sl.	+	+	2nd. day	24hrs. low
140cc	-	50M.	-	sl.	sl.	-	+	-	-
145cc	0.5 gm.	45M.	-	sl.	sl.	+	+	-	-
150cc	-	45M.	-	sl.	sl.	+	+	-	-
150cc	-	55M.	-	mod.	free	+	+	-	-
140cc	0.5 gm.	50M.	-	sl.	sl.	+	+	-	-
155cc	-	50M.	-	mod.	mod.	-	+	preop.	24hrs. low
140cc	-	45M.	-	sl.	sl.	-	+	-	-
145cc	-	45M.	-	sl.	sl.	-	+	2nd. day	24hrs. low
150cc	0.5 gm.	50M.	-	sl.	sl.	+	+	-	-
160cc	-	50M.	2 pts.	sl.	sl.	+	+	11th. day	18hrs. 101°
150cc	0.5 gm.	50M.	10 oz.	mod.	mod.	+	+	-	-
160cc	-	50M.	-	sl.	sl.	+	+	-	-
150cc	-	55M.	-	sl.	sl.	+	+	5th. day	24hrs. 100°
140cc	-	50M.	8 oz.	mod.	mod.	+	+	3rd. day	24hrs. 101.5°
140cc	-	55M.	8 oz.	mod.	mod.	+	+	-	-
145cc	-	50M.	-	sl.	sl.	+	+	-	-

Breasts	Post-operative Complications						Remarks	No.
	Chest	Bladder	Ileus	Distn.	Wound	Others		
-	-	-	-	-	-	-	Satisfactory.	1
-	-	-	-	-	-	-	Satisfactory.	2
-	-	-	-	-	-	-	Satisfactory.	3
-	-	-	-	-	-	-	Occipito-posterior.	4
-	-	-	-	-	-	-	Satisfactory.	5
-	-	-	-	-	-	-	Plac. Praevia III Fibroids enucld.	6
-	-	-	-	-	-	-	Transverse Lie.	7
-	-	-	-	-	-	-	Toxaemia. Plac. Praevia IV	8
-	-	-	-	-	-	-	Satisfactory.	9
-	-	B.Coli Cystit.	-	-	-	-	Sulphonamides.	10
-	-	-	-	-	-	-	Restless.	11
-	-	-	-	-	serous disch. 2 SWS.	-	Anaémia. Transfused 8th. day.	12
-	-	-	-	-	-	-	Anaemia. Transfused 6th. day.	13
-	-	-	-	-	-	-	Satisfactory.	14
engorged	-	-	-	-	-	-	Satisfactory.	15
-	-	-	-	-	-	-	Anaemia. Transfused 3rd. day. Pl. P.III	16
-	-	-	-	-	-	-	Plac. Praevia III	17
-	-	-	-	-	-	-	Satisfactory.	18

Amt. of Local	Pentothal	Time for opn.	A.P.H.	I.P.H.	L.P.H.	Pitoc. 3units	Ergom. 0.5mgm	Pyrexia Onset	Pyrexia Degree
160cc	0.5 gm.	50M.	-	sl.	sl.	+	+	10th. day	24 hrs. 100°
130cc	0.5 gm.	45M.	-	sl.	sl.	+	+	-	-
135cc	-	45M.	-	sl.	sl.	+	+	-	-
140cc	-	50M.	5 oz.	mod.	mod.	+	+	-	-
150cc	0.5 gm.	50M.	-	sl.	sl.	+	+	-	-
145cc	-	45M.	-	sl.	sl.	+	+	-	-
150cc	0.25gm.	60M.	-	sl.	mod.	+	+	-	-
140cc	-	45M.	-	sl.	sl.	+	+	-	-
135cc	-	50M.	-	sl.	sl.	+	+	-	-
140cc	-	50M.	-	sl.	sl.	+	+	-	-
145cc	-	45M.	-	sl.	sl.	+	+	-	-
150cc	-	45M.	-	sl.	sl.	+	+	-	-
140cc	0.5 gm.	45M.	-	sl.	sl.	-	+	-	-
140cc	-	45M.	-	sl.	sl.	+	+	-	-
150cc	-	50M.	-	sl.	sl.	+	+	-	-
145cc	-	50M.	-	sl.	sl.	-	+	-	-
140cc	-	50M.	-	sl.	sl.	-	+	-	-
140cc	-	50M.	-	sl.	sl.	-	+	-	-
145cc	-	50M.	-	sl.	sl.	+	+	-	-
140cc	-	50M.	-	sl.	sl.	+	+	-	-
160cc	0.5 gm.	50M.	10 oz.	sl.	sl.	+	+	-	-
120cc	0.5 gm.	45M.	-	sl.	sl.	+	+	-	-

Breasts	Post-operative Complications						Remarks	No.
	Chest	Bladder	Ileus	Distn.	Wound	Others		
-	-	-	-	-	stitch sinus	-	Restless. Penicillin to wd.	19
-	-	-	-	-	-	-	Large baby.	20
-	-	-	-	-	-	-	Mitral Stenosis	21
-	-	-	-	-	-	-	Plac. Praevia II	22
-	-	-	-	-	-	-	Restless.	23
-	-	-	-	-	-	-	Satisfactory	24
-	-	-	-	-	-	-	Fibroids enucld.	25
-	-	-	-	-	-	-	Satisfactory.	26
-	-	-	-	-	-	-	Satisfactory.	27
-	-	-	-	-	-	-	Satisfactory.	28
-	-	-	-	-	-	-	Satisfactory.	29
-	-	-	-	-	-	-	Satisfactory.	30
-	-	-	-	-	-	-	R.O.P.	31
-	-	-	-	-	-	-	Satisfactory.	32
-	-	-	-	-	-	-	Breech.	33
-	-	-	-	-	-	-	Satisfactory.	34
-	-	-	-	-	-	-	Satisfactory.	35
-	-	-	-	-	-	-	Breech.	36
-	-	-	-	-	-	-	Satisfactory.	37
-	-	-	-	-	-	-	Satisfactory.	38
-	-	-	-	-	-	-	Plac. Praevia III	39
-	-	-	-	-	-	-	Satisfactory.	40

Amt. of Local	Pentothal	Time for opn.	A.P.H.	I.P.H.	P.P.H.	Pitoc. 5units	Ergom. 0.5mgm	Pyrexia Onset	Pyrexia Degree
140cc	-	55M.	10 oz.	sl.	sl.	-	+	-	-
140cc	-	45M.	20 oz.	mod.	sl.	-	+	-	-
140cc	-	50M.	-	sl.	sl.	+	+	5th. day	24hrs. 101°
135cc	-	45M.	-	sl.	sl.	-	+	-	-
135cc	-	45M.	12 oz.	sl.	sl.	+	+	-	-
140cc	-	50M.	-	sl.	sl.	-	+	1st. day	24hrs. 101.2°
130cc	-	45M.	-	sl.	sl.	+	+	8th. day	24hrs. 102.°
135cc	-	45M.	-	sl.	sl.	-	+	-	-
140cc	0.25gm.	50M.	-	sl.	sl.	+	+	preop	6 days 104°
135cc	-	50M.	20 oz.	sl.	sl.	+	+	-	-
150cc	-	50M.	6 oz.	sl.	sl.	+	+	5th. day	24hrs. 102°
140cc	-	50M.	-	sl.	sl.	-	+	-	-
130cc	0.25gm.	55M.	-	sl.	sl.	+	+	-	-
135cc	-	50M.	-	sl.	sl.	-	+	-	-
130cc	0.25gm.	45M.	-	sl.	sl.	+	+	-	-
155cc	-	50M.	-	sl.	sl.	+	+	-	-
135cc	0.25gm.	45M.	-	sl.	sl.	+	+	-	-
150cc	-	45M.	-	sl.	sl.	-	+	-	-
155cc	0.25gm.	50M.	-	sl.	sl.	+	+	-	-
150cc	0.25gm.	50M.	-	sl.	sl.	+	+	-	-

Breasts	Post-operative Complications						Remarks	No.
	Chest	Bladder	Ileus	Distn.	Wound	Others		
-	-	-	-	-	-	-	Plac. Praevia III	41
-	-	-	-	-	-	-	Plac. Praevia IV	42
-	-	B.Coli Pyelit.	-	-	-	-	Sulphonamides.	43
-	-	-	-	-	-	-	Mitral Stenosis.	44
-	-	-	-	-	-	-	Plac. Praevia III	45
-	creps +	B.Coli Pyelit.	-	-	-	-	Cong. Failure. Mitral Stenosis.	46
-	-	B.Coli Pyelit.	-	-	-	-	Sulphonamides.	47
-	-	-	-	-	-	-	Satisfactory.	48
-	-	B.Coli Pyelit.	-	-	-	-	Brow presentn. Chemotherapy.	49
-	-	-	-	-	-	-	Plac. Praevia IV	50
ergorged	-	-	-	-	-	-	Toxaemia.	51
-	-	-	-	-	-	-	Satisfactory.	52
-	-	-	-	-	-	-	Fibroids enucld.	53
-	-	-	-	-	-	-	Satisfactory.	54
-	-	-	-	-	-	-	Breech.	55
-	-	-	-	-	-	-	Satisfactory.	56
-	-	-	-	-	-	-	Cont. Outlet.	57
-	-	-	-	-	-	-	Satisfactory.	58
-	-	-	-	-	-	-	Cont. Pelvis.	59
-	-	-	-	-	-	-	Restless.	60

Amt. of Local	Pentothal	Time for opn.	A.P.H.	I.P.H.	P.P.H.	Pitoc. 5units	Ergom. 0.5mgm	Pyrexia Onset	Pyrexia Degree
140cc	-	40M.	-	sl.	sl.	-	+	-	-
130cc	0.25gm.	45M.	-	sl.	sl.	+	+	-	-
150cc	-	45M.	-	sl.	sl.	-	+	-	-
145cc	-	45M.	-	sl.	sl.	+	+	-	-
130cc	0.25gm.	45M.	-	sl.	sl.	+	+	-	-
155cc	-	45M.	-	sl.	sl.	-	+	-	-

Breasts	Post-operative Complications						Remarks	No.
	Chest	Bladder	Ileus	Distn.	Wound	Others		
-	-	-	-	-	-	-	Satisfactory.	61
-	-	-	-	-	small moist area	-	Breech with Extended legs.	62
-	-	-	-	-	-	-	Satisfactory.	63
-	-	-	-	-	-	-	Satisfactory.	64
-	-	-	-	-	-	-	Unmarried. Restless. Satisfactory.	65
-	-	-	-	-	-	-	Dyspnoea in labour Aortic Incompetence.	

INFANT TABLE

Child	Maturity wks.	Delivery. Hand Forceps Willetts	Colour	When Breathed	When Cried	Pentothal
A	36	Head-Hand	Good	At once	At once	-
A	38	Head-Hand	Good	At once	At once	-
A	38	Breech	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	0.5 gm.
A	40	Head-Hand	Good	At once	At once	-
A	40	Breech	Good	At once	At once	-
A	40	Breech	Good	At once	2 min.	0.5 gm.
A	40	Head-Hand	Good	10 sec.	1 min.	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	0.5 gm.
A	40	Head-Hand	Good	At once	½ min.	-
A	36	Head-Hand	Good	At once	At once	0.5 gm.
A	39	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	36	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	0.5 gm.
A	40	Head-Hand	Good	At once	At once	0.5 gm.
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	' min.	0.5 gm

Asphyxia Lobeline O_2 - CO_2	Weight lbs	ozs	Remarks	No.
-	7	4	Diabetic Mother. Bottle fed. Glucose i.m.	1*
-	6	2	Breast fed	2*
-	8	6	Breast fed. Mother congenital heart.	3*
-	8	10	Breast fed.	4
-	6	0	Meconium ++. Prophyl. Penicillin. Breast fed	5*
-	8	3	Transverse Lie. Breast fed. Plac. Praevia III	6*
-	6	9	Transverse Lie. Difficult delivery. Mucus ++	7*
-	7	15	Foetal Distress. Mucus, Meconium ++. Breast fed	8*
-	6	15	Severe Toxaemia of Mother. Meconium in liquor	9*
-	9	4	Satisfactory. Breast fed.	10
-	8	5	Breast fed.	11
-	7	7	Plac. Praevia III. F.H. irregular. Breast fed	12*
-	5	2	Plac. Praevia III. Breast fed.	13*
-	7	12	Breast fed.	14
-	9	0	Toxaemia of mother. Breast fed.	15*
-	6	15	Plac. Praevia III. Breast fed.	16*
-	7	0	Plac. Praevia III. Breast fed.	17*
-	7	12	Repeat section. Breast fed.	18
-	8	0	Inertia. Membranes ruptured 36hrs. Breast fed.	19*
-	10	5	Large baby. Breast fed.	20
-	6	12	Bottle fed. Mother Chr. Rheumatic Endocarditis	21*
-	5	5	Plac. Praevia II. Breast fed.	22*
-	8	4	Breast fed.	23

Child	Maturity wks.	Delivery Hand Forceps Willetts	Colour	When Breathed	When Cried	Pentothal
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	0.25gm.
A	40	Head-Hand	Good	At once	At once	-
A	40	Breech	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	0.5 gm.
A	40	Head-Hand	Good	At once	At once	-
A	40	Breech	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	--
A	40	Head-Hand	Good	At once	At once	-
A	40	Breech	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	38	Head-Hand	Good	At once	At once	0.5 gm.
A	39	Head-Hand	Good	At once	At once	0.5 gm.
A	36	Breech	Good	At once	At once	-
A	36	Head-Hand	Good	At once	At once	-
A	38	Head-Hand	Good	At once	At once	-
A	38	Head-Hand	Good	At once	At once	-
A	39	Head-Hand	Good	At once	At once	-
A	38	Head-Hand	Good	At once	At once	-

Asphyxia Lobeline (O_2 CO_2)	Weight lbs--ozs		Remarks	No.
-	8	2	Breast fed.	24
-	8	0	Pentothal after extraction of child. Breast fed	25
-	7	10	Breast fed.	26
-	7	3	Breast fed.	27
-	8	2	Breast fed.	28
-	8	0	Toxaemia and Inertia. Membranes rupt. 24hrs.	29*
-	7	4	Breast fed.	30
-	6	1	Occiput Posterior. Breast fed.	31
-	6	10	Breast fed.	32
-	7	3	Breast fed.	33
-	8	4	Previous section. Breast fed.	34*
-	8	1	Repeat section. Breast fed.	35
-	9	0	Breast fed.	36
-	8	4	Breast fed. Pyloric stenosis. Ramstedt 5wks.	37
-	6	10	Breast fed.	38
-	7	3	Plac. Praevia III. Breast fed.	39*
-	8	4	Breast fed.	40
-	5	4	Plac. Praevia III. Breast fed.	41*
-	5	2	Plac. Praevia IV. Breast fed.	42*
-	6	4	Toxaemia of Mother. Breast fed.	43*
-	7	2	Bottle fed. Mother Chr. Rheumatic Endocarditis	44*
-	6	2	Plac. Praevia II. Breast fed.	45*
-	7	7	Bottle fed. Mother Chr. Rh. Endocard in failure	46*

Child	Maturity wks.	Delivery Hand Forceps Willetts	Colour	When Breathed	When Cried	Pentothal
A	36	Breech	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	0.25gm.
A	35	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	o.25gm.
A	40	Head-Hand	Good	At once	At once	-
A	40	Breech	Good	At once	At once	0.25gm.
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	0.25gm.
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	0.25gm.
A	40	Head-Hand	Good	At once	At once	0.25gm.
A	40	Head-Hand	Good	At once	At once	-
A	40	Breech	Good	At once	At once	0.25gm.
A	40	Breech	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	-
A	40	Head-Hand	Good	At once	At once	0.25gm.
A	40	Head-Hand	Good	At once	At once	-

Asphyxia		Weight		Remarks	No.
lobeline		lbs	ozs		
O_2	CO_2				
-		8	0	Bottle fed. Diabetic Mother. Glucose i.m.	47*
-		8	0	Breast fed. Toxaemia of Mother.	48*
-		9	4	Pressure necrosis of upper lip and alveolar margin. Staph. aureus infection - only slightly Penicillin sensitive. Penicillin and Sulphonamides from birth. Bronchopneumonia, died 4th. day.	49*
-		5	4	Plac. Praevia IV. Breast fed.	50*
-		8	4	Foetal Distress. A.P.H. Breast fed.	51*
-		7	6	Breast fed.	52
-		7	10	Breast fed. Fibroids enucleated.	53
-		8	0	Breast fed. Occiput Posterior.	54
-		7	13	Breast fed. Contracted Pelvis. Difficult Delivery .	55
-		8	3	Breast fed. Disproportion.	56
-		8	5	Rh -ve. Contracted Outlet. Breast fed.	57
-		8	4	Breast fed. Repeat section.	58
-		9	0	Rh -ve. Breast fed.	59
-		8	0	Breast and bottle fed.	60
-		7	9	Breast fed.	61
-		7	11	Breast and bottle fed.	62*
-		8	5	Breast fed.	63
-		7	2	Breast fed.	64
-		8	4	Breast fed. Repeat section.	65
-		7	0	Bottle fed. Rheumatic Heart Disease of Mother	66*

ADDENDA.

ADDENDA.

There have been two additional cases since completion of the series making the total 100 in all.

Case no.99,M.D. She was aged 41 years, had been married eight years and had had four miscarriages in 1943, 1944, 1947 April, and 1947 September, respectively. Injections of progesterone and vitamin E by mouth had been given from the fourth till the thirtysecond week of her pregnancy.

Two weeks before term she developed albuminuria,hypertension, and oedema. An "elective" lower segment section was performed, and a live infant weighing 7lbs. was delivered. Local analgesia was used throughout and the time taken was 50 minutes. The puerperium was uneventful.

Case no.100,I.M. This was a primigravida aged 27, admitted as an emergency with uterine inertia, pre-eclamptic toxaemia-- B.P.162/100, albuminuria, oedema and a temperature of 100.2°. Her membranes had been ruptured 48 hours and innumerable pelvic examinations made before admission. Labour was obstructed, the head posterior and high and tightly wedged against the symphysis pubis; the bladder was inert and the bowel and stomach distended.

Pentothal gm$\frac{1}{4}$ was given to relax retraction ring present at operation. The child cried at once and the mother regained consciousness after a few minutes. The puerperium was uneventful.

Corrected Neonatal Mortality= 1%.

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