REVIEW
OF
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Origin of the term caesarean section is obscure. Although generally believed, but it is unlikely, that the term is derived from "Julius caesar" (Born in 100 BC), or the Roman Law 'Lex regia' (Eighth century). Existence of such operation is not even mentioned by Hippocrates, Galen, Celsus or any other medical writer of that time (Williams obstetrics).

Caesarian section on dead was practised soon after christian church gained dominance, as a measure directed at baptism of the child. The first authoritative report about the early use of this operation was published in 1668 by the great french obstetrician Francois Mauricean. The report shows that the operation was performed on the living in rare and desperate cases and was usually fatal. The situation was same till the end of 19th century because the suturing of uterine wall was not known at that time.

The turning point in evolution of caesarean section came in 1882 when Max Sanger introduced suturing of uterine wall. First use of extra peritoneal approach by Frank in 1907 and lower segment approach by Back in 1919 is history by itself. Kerr in 1926 introduced transverse incision which is the most commonly employed incision today (Williams obstetrics).

First use of anaesthesia for caesarean section was done a century ago. During the second half of the nineteenth century, chloroform and ether were used almost exclusively. Maternal deaths due to aspiration of gastric contents and cardiovascular collapse occurred occasionally. Moreover, because the anaesthetic
was often administered in high concentration for intra-abdominal surgery, it undoubtedly produced severe depression of the neonate.

Spinal analgesia for caesarean section was first used in 1900 by Doleris and Malartic and lumbar extradural analgesia was described by Pickles and Jones in 1928. Despite their theoretical advantage over general anaesthesia practised at that time, regional blocks were infrequently used till fourth decade. However with improved technique later, the regional blocks became more and more popular. During the period between 1935 to 1942, out of 562 consecutive caesarean section 345 were given spinal analgesia in Israel Zion hospital (Frederick Wein-traub, 1942) with out a single mortality attributable to anaesthetic. Spinal analgesia was considered superior to other forms of local or general anaesthesia, because of rapidity of administration, relative rapidity of effect, more complete anaesthesia and early post operative tolerance of fluids. The disadvantage being episodes of retching and Hypotension that followed spinal analgesia.

Hollamn et al (1944) gave an account of 1415 deliveries, including caesarean, in which thiopentone Na upto 2 gms was used. Foetal mortality where foetus was known to be alive before commencement of anaesthesia was 2.4 percent. They also measured maternal and foetal blood levels of thiopentone in some cases and concluded that there was a delay of about 12 minutes before foetal thiopentone level became equal to maternal level and they claimed that if the delivery was delayed beyond this time foetal blood concentration of thiopentone might reach dangerously high level.
Cohen et al (1953) reported that the time taken over the delivery was of little consequence in relation to degree of neonatal depression and indeed the longer the laps of time the less is the likelihood of the drug affecting the neonate. Crawford et al (1956) in their study found that there was no clinical evidence of foetal depression attributable to anaesthesia what ever is the length of time between induction and delivery.

There was no standard method for assessment of newborn upto 1952, and terms like asphyxiated baby and apnoeic baby were frequently used to express the condition of neonate. Virginia Apgar (1953) described a method of evaluation of the newborn infant in 1952, which is the standard method of assessment of clinical condition of the neonate even today. She described five objective signs which pertained to the condition of the newborn and a rating of zero, one or two was given to each sign depending upon whether it was absent or present.

The signs used are heart rate, respiratory effort, reflex irritability, muscle tone and colour. A score of ten indicates a newborn is in best possible condition. The Apgar score method was further analysed and developed by Apgar and James (1962) and Crawford et al (1973). It was observed that the color is the most unsatisfactory sign. All infants are more or less cyanotic at birth because of their high capacity for carrying oxygen and relatively low oxygen content and saturation chart of Apgar score.

The technique of balanced anaesthesia using a sequence of oxygen, thiopentone suxamethonium followed by endotracheal intubation with a cuffed tube and nitrous oxide-oxygen. (614) was described by Hodges and Tunstall (1961). No other drug was used
before delivery of the infant except intermittent injections of suxamethonium if required. They claimed that this technique produced minimal foetal depression and is superior to conduction blocks. Virginia P. Hartridge and Robert B Wilson (1963) proposed a similar technique for balanced anaesthesia. In their technique muscle relaxation was obtained by an intravenous drip of 0.2 percent suxamethonium. This remains the most popular technique of general anaesthesia for caesarean section even today. Montgomery (1961) compared this technique with the sequence of thiopentone, suxamethonium, Nitrous oxide-oxygen and Halothane. He found that the latter causes more foetal depression.

J. Selwyn Crawford (1962) proposed a method of evaluating a technique of anaesthesia for caesarean section. He deplored the indiscriminate comparison of techniques for caesarean section by use of a mass of unselected data. He observed that incidence of neonatal depression varies markedly with the degree of obstetric complications, whatever may be the technique of anaesthesia used. So he suggested that when technique of anaesthesia for caesarean section are compared, reference must be made to the obstetric factors involved.

Hyperventilation has been used as an aid to production of unconsciousness, but the respiratory alkalosis thus produced in mother may however cause lowering of foetal Po2, a delay in the onset of normal respiration and a low Apgar scores at 1 minute (Holmes Frank 1963). But Coleman (1967) and Scott et al (1969) did not observe any harmful effect on the neonate due to hyperventilation in mother.

In a series of cases of elective caesarean sections, general anaesthesia (Standard technique of balanced anaesthesia) and
spinal analgesia was compared (Crawford, 1966). It was found that when allowance was made for the extent of the induction-delivery interval, the infants delivered under general anesthesia were less asphyxiated at delivery than those delivered under spinal analgesia. It was suggested that this is reflective of the action of the obligatory vasopressors on the utero-placental hemodynamics. On the other hand, Shnider et al. (1968) demonstrated in ams that ephedrine arrested or even corrected the foetal acidosis resulting from post spinal hypotension.

Maternal hypotension during spinal analgesia for caesarean section has been a persistent problem and there are evidences that foetal deterioration can result (RICHARD AND CLARK et al., 1976). It was suggested that this should be prevented with infusion of 5 percent dextrose in ringer's solution combined with left uterine displacement when spinal analgesia is used for caesarean section. Reports by Greiss and Crandell (1965) and by Wollman and Marx (1969) have also indicated that post spinal hypotension in pregnant woman can safely be treated as well as prevented by the rapid intravenous infusion of balanced electrolyte solutions, so that drug therapy may be unnecessary. E.V Cosmi and G.F Marx (1969) compared general anaesthesia and spinal analgesia with treatment of hypotension by forced hydration and spinal analgesia with prophylactic hydration produced more favourable biochemical and clinical condition of newborn than spinal analgesia with therapeutic hydration. The general anaesthesia was associated with a higher incidence of neonatal depression than either of the spinal analgesia group.

To improve foetal oxygenation during caesarean section Rorke et al. (1968) studied the effect on neonate of giving 33, 66 and 100
percent oxygen during anaesthesia to the mother. They observed that the foetal oxygenation can be improved by increasing maternal PaO₂, but to a maximum level of about 300 Torr, which can be achieved if inspired gas mixture has about 66 percent oxygen. Above this level of maternal PaO₂ foetal oxygenation deteriorates probably due to vasoconstriction in placental vasculature in response to high PaO₂. They observed higher Apgar score in infants born to mothers who were given 66 percent oxygen. Anis Baraka (1970) advocated maternal hyperventilation with 50 percent oxygen in inspired gas mixture for optimal foetal oxygenation. But when a high oxygen concentration with less nitrous oxide is used then some supplementary anaesthesia is often required to ensure unconsciousness of the mother. DD moir (1970) used halothane for this purpose. He compared nitrous oxide-oxygen in ratio of 70:30 unsupplemented and 50:50 with 0.5 percent halothane. High incidence of low Apgar score (1 to 3) was noticed in the first group and there was no suggestion that 0.5 percent halothane causes neonatal depression. In fact it improves the condition of the neonate by allowing a higher concentration of oxygen to be administered.

Anis Baraka (1971) compared the incidence of neonatal depression when either propanidid or thiopentone was used for induction of general anaesthesia for elective caesarean section. They reported that the incidence of neonatal depression was higher in the thiopentone group than in the propanidid group, particularly when the induction delivery time was prolonged more than 10 minutes. This was attributed to the different fates of these drugs. Earlier Bradford et al (1969) had got similar results. Other intravenous anesthetic drugs were studied for
using as induction agent in caesarean section like ketamine by Meer et al (1973) and Althesin and Downing et al (1974). Although they did not have any depressing effect on the newborn but they did not offer much advantage over the most commonly used induction agent—Thiopentone. While studying the effect of time and lateral tilt Crawford et al (1972) observed greater degree of neonatal asphyxia in non-tilted patients than those who were even given left lateral tilt on operation table.

This disparity was increased with prolongation of induction-delivery interval. Time factor was earlier studied by R Kalappa et al (1971) and Stenger et al (1969). They also got similar results. The latter author attributed the depression of neonate to significantly elevated nitrous oxide concentration in the newborn infant.

I Kivalo and S Saarikoski (1976) studied the placental transfer of curare and advocated that since curare is able to cross placenta in small but detectable amounts, it is better for the foetal well being to exclude the drug before the delivery especially when the foetal compromise is suspected.

There has been recently an increasing interest in exploring the subtle neonatal effect of drugs used for maternal sedation or analgesia. Scanlon et al (1974) suggested that neurobehavioral testing may present a valuable way to assess the effects of the maternally administered drugs on the new born infant. This can assess the effect of a more subtle nature than can be measured by Apgar scoring alone. They also devised a neurobehavioral examination which has proved to be simple, rapid and reproductible technique of assessing some aspects of the new born behaviour in the early hours of life.
Downing et al (1977) compared epidural and general anaesthesia for caesarean section. Neonatal acid-base values and Apgar score showed no significant differences between the two groups. Hollmen et al in 1978 got similar results. They also compared the neurobehavioral response of infant and found that all infants of high risk obstetric patients, independent of the anesthetic technique used, had abnormal neurological activity. There was a significant correlation between the depression of neurological activity and maternal hypotension. They also suggested that while comparing the effects of anesthetic techniques on the neonate, in addition to acid-base values and Apgar score, infants neurological recovery which is a more sensitive index of neonatal well being, should be used.

Studying the placental blood flow during caesarean section under lumbar extradural analgesia, Jouppila et al (1978) found that it decreases by 13 percent and despite this all newborn infants were in good clinical condition, because of healthy foetus can tolerate well up to 50 percent reduction in placental blood flow for a short duration. They suggested that it may cause abnormal neurobehavioral recovery of the newborn infant, but Cork et al (1982) found no effect on clinical condition or neurobehavioral of newborn due to post spinal maternal hypotension of short duration (less than 2 minutes).

Several studies have compared the condition of infants delivered by elective LSCS under General Anaesthesia with that of regional analgesia was provided (Datta and Brown 1977, James et al 1977, Palahniuk et al 1977, Hollman et al 1978, Downing, Houlton and Barclay, 1979 Fox et al (1979) the opinion of the majority was that infants delivered under regional
anaesthesia were comparatively better condition giving consideration to U-D interval but not considering the presentation of the infant at the time of caesarean section. U-D interval was relatively prolonged in extradural block. When the U-D interval was less than 90s the infant born under extradural analgesia was more acidic than those born under general anaesthesia.

The requirement of adequate oxygenation and minimal drug induced depression of foetus at delivery, and avoidance of intraoperative maternal awareness is an ideal general anaesthetic technique for caesarean section. The use of 50% Nitrous oxide in oxygen, with the addition of low concentrations of volatile agents represents current practice. E.G LAWES, B Newman, M.T Campbell, M Irwin, S Doleuska and TA Thomas in 1988 did a comparative study of 50% and 33% groups. No difference were found between 1 or 5 Min Apgar score or TSR values. It was concluded that no difference in fetal outcome or acid-base status can be detected when maternal FIO2 is decreased from 0.5 to 0.33, and that the use of 33% oxygen in 66% nitrous oxide appears to be safe for neonates who have not suffered foetal distress before delivery.

D.G Bogot, M Roseu ad G.A.D Rees did a study on maximum FIO2 during caesarean section giving 100% oxygen and did comparative study with a group getting 50% oxygen. The umblical venous FIO2 in the oxygen(100%) only was higher than the oxygen Nitrous oxide group. Blood loss and uterine contractibility was unaffected by increased conc of volatile agents. Improved cardiovascular stability was seen in the elective high oxygen group.
During pregnancy metabolic rate and CO2 production increase by 30-50%. In addition, hyperventilation occurs, causing reduction in CO2 tension (Pa CO2) to 3.3 - 4.3 kPa. These effects are present from 18 weeks gestation—both these factors produce an increase in the awake resting minute volume of pregnant patients between 42% and 57%. Moreover, such severe marked hyperventilation can occur during labour. These metabolic and respiratory changes persist for 2-14 days in postpartum. A J Rampton, S Mallaiah and CPO Garrett did a study on increased ventilation requirement during obstetric general anaesthesia in which they found if the F3% of 181 ml per Kg/min and 109 ml per Kg/min after delivery was essential to maintain 57% and 48% resting minute volume.

The period of labour, delivery and first minute after birth carry a high risk of asphyxia. The newborn infant must successfully inflate and adapt the lungs to the neonatal circulation immediately after birth. This complex physiological process can be adversely affected by many factors—including maternal analgesia and anaesthesia, J F Murphy, M Duncey, G A D Rees, M Rosen and CPO Ray 1984 did a study on obstetric analgesia, anaesthesia and the Apgar score. The Apgar score of babies born in epidural block was significantly better, the Apgar score of infants born of caesarean section was low comparatively in 40% cases. Likely causative factors include undue sensitivity of infants, respiratory centre and aortocaval compression during surgery.

G F Marx, W M Luykx and S Cohen in 1984 did a comparative study of newborns delivered by elective caesarean section under regional and general anaesthesia. They have demonstrated better clinical outcomes with regional techniques. Apgar—minus-colour
stores were lower and time-to-sustained respiration longer in infants born under general anaesthesia than in babies born under extradural block.

The study was done by Allen, S Maigaard, JH Christensen, F Andreasen and A. Forman in 1987 in which they studied the effect of thiopentone or chlormethiazole on human placental stem villous arteries. The concentration of the two drugs needed to affect contractile activation of isolated human stem villous arteries exceeded the free plasma concentrations reached during anaesthesia induced by the agents during caesarean section. The results do not suggest any major effects of thiopentone or chlormethiazole on foetal placental vascular resistance during chemical use of these drugs.

Cardiac output changes during caesarean section - a study was done by B Newman in 1982. He found by Transcutaneous aortovelography (TAV) - a non-invasive Doppler ultrasound technique for measuring flow velocity of blood in the transverse thoracic aorta. There is increase in cardiac output after induction and commencement of surgery (mean 19% P< 0.05) and after delivery was found.

R. Jouppila, J Puolakka, A. Kauppila and J. Vuori in 1984 did a study on maternal and umbilical cord plasma noradrenaline concentrations during labour with and without segmental extradural analgesia, and during caesarean section. It was found that umbilical venous and arterial concentrations of nor adrenaline were lower after caesarean section than after vaginal delivery. However, extradural analgesia did not affect the foetal noradrenaline concentrations. Since noradrenaline is required for
the adaptation of the newborn to extrauterine life, the unaltered fetal response may be beneficial.

Hypotension during Epidural anaesthesia for caesarean section is a known phenomenon. A study was conducted by D. Hallworth, J.A Jellicoe and R.G. Wilkies in 1982 in which a comparison of intravenous loading with crystalloid and colloid solution was done. In one group a preload of 1 litre of Hartmann's solution was done and in other group pre-load of 0.5 litre of Haemaccel (Polygelatin) and 0.5 litre of Hartmann's solution was done. Hypotension occurred in 45% cases in Hartmann's group but in only 5% of the polygelatin and Hartmann's group. An argument for the use of 2 litres of intravenous preload of crystalloid solution is offered to provide prophylaxis against Hypotension occurring during caesarean section under epidural anaesthesia.

A.G. Davis, MB, Ch B, FFARCS consultant Anaesthetist Southern General Hospital Glasgow gave a report in 1982. The reports of inquiries into maternal mortality show that general anaesthesia remains a prominent cause of maternal deaths. The almost universal association with avoidable factors makes these deaths particularly regrettable. Most of these deaths due to anaesthesia have been caused by acid aspiration syndrome or hypoxic cardiac arrest associated with difficult or failed tracheal intubation, and it is now well recognised that the avoidance of general anaesthesia wherever possible must be a major part of the strategy in preventing further such tragic deaths in young women.

Properly administered regional block not only overcomes the problems of failed tracheal intubation, acid aspiration
syndrome and awareness during general anaesthesia but also carries the advantages of greater maternal satisfaction and postoperative well being, and a more vigorous condition of the baby at birth. Against these advantages are drawbacks, namely the length of time taken to induce an epidural block, and the lack of universal acceptability. It is important to assess the incidence of these problems. Patients who are at risk from haemorrhage or coagulopathy will continue to require general anaesthesia.