

A history of caesarean section: From ancient world to the modern era

Donald TODMAN

Brisbane Clinic, 79 Wickham Terrace, Brisbane, Queensland, Australia

Abstract

Caesarean section has been recorded in history since ancient times in both Western and non-Western literature. Although the first use of the term in obstetrics was from the seventeenth century, its early history is obscured by mythology. The origin of the term caesarean is believed to be from the birth of Julius Caesar; however, this is unlikely considering his mother Aurelia Cotta lived for many years afterwards. In ancient times, it was performed only when the woman was dead or dying as an attempt to rescue the fetus. With few exceptions, this was the pattern until the era of anaesthesia in the nineteenth century. Developments in surgical technique from the later nineteenth century and through the twentieth century have refined the procedure, with resulting low morbidity and mortality. As a consequence, the objectives of caesarean section have evolved from rescuing the fetus or for cultural or religious reasons towards concerns for the safety of mother and child as well as considering the mother's preferences.

Key words: caesarean section, history, obstetrics.

From the *Oxford English Dictionary*, the etymology of caesarean section derives from the Roman legal code, the *lex Caesare*.¹ This law had its origins as the *lex Regia* from the eighth century BC and prescribed that a baby should be cut from its mother's womb if she dies before giving birth.² Similar terminology is evident in other languages, for example, in the German term *Kaiserschnitt* (Emperor's section). The derivation of Caesar and caesarean is from the Latin verb *caedere* 'to cut'. Children born by post-mortem operations were referred to as *caesones*. The surname Caesar was attached to the family Julius beginning with Sextus Julius Caesar, who was praetor in 208 BC. Why the name was added remains debatable, though it may be that a member of the family was born with a shock of hair called *caesaries* or that they had blue or bluish-grey eyes, *oculi caesii*. When Augustus, the adopted son of Julius Caesar, became emperor in 27 BC he took the name Caesar, as did the succeeding emperors.

Ancient and medieval history

The story of Julius Caesar's birth comes from Pliny the Elder, who wrote extensively on medical matters including childbirth.³ Much of his writing is from the perspective of traditional folklore practice in an agrarian age. Caesar's mother Aurelia survived childbirth and outlived her son to bury him 55 years later. The fact that she lived and gave birth successfully rules out the possibility that Caesar was born in this way (Fig. 1). In Jewish literature, Maimonides

records that it was well known in Rome how to perform this operation without killing the mother, but that it was seldom performed.⁴ Although the ancient writers suggest that it was undertaken in live mothers presumably for difficult births, the complications of haemorrhage and infection make it most unlikely that the woman could survive. There is no mention of the procedure in Soranus *Gynaecology*, the most eminent surviving text on midwifery nor from the writings of Hippocrates which contains sections on difficult births.^{5,6}

A single reference by Galen refers to the procedure '... the way in which the abdomen of the pregnant woman must be cut open and the child helped out while it is still fixed to the uterus, is not of our invention but has been described by many of the early authors.'⁷

There are sporadic reports of historical figures born by caesarean section. Raymond Nonnatus (1204–1240), the Catalan saint, was given his surname from the Latin-*non-natus* (not born) because he was born in this manner. His mother died in childbirth.⁸ In 1316, Robert II of Scotland was born by caesarean section and his mother Marjorie Bruce died. This event may have been the inspiration for Macduff in Shakespeare's *Macbeth*. In the play, Macbeth hears a prophecy that 'none of woman born shall harm Macbeth',

Correspondence: Dr Donald Todman, Brisbane Clinic, 79 Wickham Terrace, Brisbane, Qld, Australia.

Email: dntodman@optusnet.com.au

DOI: 10.1111/j.1479-828X.2007.00757.x

Received 05 April 2007; accepted 02 July 2007.



Figure 1 The birth of Julius Caesar being surgically removed from his mother. Woodcut illustration from *Lives of the Twelve Caesars* (1506 edition). Courtesy National Library of Medicine.

which is at first reassuring but then he discovers that Macduff was ‘from his mother’s womb untimely ripp’d’, the product of caesarean section reminiscent of the birth of Robert II of Scotland.⁹

Caesarean section was performed for the sake of the child, with the mother sacrificed. Despite occasional references to operations on living mothers, mostly it was to retrieve the infant from a dead or dying mother. This was undertaken perhaps in the vain hope of saving the child or for religious reasons, to bury the child separately from the mother. Principally, it was a procedure of last resort and was not intended to save the mother’s life. With rare exceptions the fate of live children born in this manner is unknown.

The first recorded case of a mother and a baby surviving caesarean section was in 1500 in Siegersausen, Switzerland, where Jacob Nufer, a pig gelder, reportedly performed the operation on his wife after a prolonged labour. She spent several days in labour and had assistance from 13 midwives but was still unable to deliver her baby. Her husband received permission from the religious authorities to perform a caesarean section. Miraculously, the mother lived and subsequently gave birth to five other children by vaginal deliveries including twins. The baby lived to the age of 77 years. Historians question the accuracy of the story considering it was not reported until 82 years after the event. It is also possible that this was an extra-uterine abdominal delivery, as it seems unlikely that she could have so many subsequent vaginal deliveries without rupture.^{10,11}

Early modern era

Following the publication in 1598 of Jacques Guillemeau’s book on midwifery in which he used the term ‘*la section Caesarienne*’, it gradually became known as caesarean section.¹² The first English edition appeared 14 years later, and his exposition seems to have been largely theoretical as he pronounced against it because of the risks involved. Prior to

the renaissance, knowledge of female pelvic anatomy was scanty. The landmark work of Andreas Vesalius *De Corporis Humani Fabrica* published in 1543 depicted female anatomy and abdominal structures with considerable accuracy.¹³ This provided the theoretical foundation for operative obstetrics, which emerged in the eighteenth and nineteenth centuries. Medical education in the mid- to late 1800s included access to human cadavers and greater emphasis on anatomy through personal dissection. Such training was available only to men and increasingly from the seventeenth century women were relegated to attendants at childbirth. From the seventeenth and eighteenth century, male practitioners such as the Chamberlens in London established themselves in the profession of ‘man-midwife’ or obstetrician.¹⁴

The development of anaesthesia in the nineteenth century paved the way for a new era in caesarean section and operative obstetrics. William Morton in 1846 at the Massachusetts General Hospital successfully removed a tumour from a patient using ether. News of this development quickly spread to Europe and in that same year Robert Liston successfully amputated a leg using ether. Ether was soon found to have disadvantages as it caused lung irritation and became unstable when exposed to air. There was however, another substance, chloroform.¹⁵

In Edinburgh in 1847, James Young Simpson experimented on himself with chloroform and induced a state of unconsciousness.¹⁶ Within two weeks he had administered chloroform to 50 patients for surgery. Although Simpson is remembered for his discovery and use of chloroform, he was also one of the outstanding figures in obstetrics in the nineteenth century. In 1847, Simpson successfully provided chloroform to the wife of a colleague during childbirth which led to its widespread use in obstetrics. Anaesthesia was opposed for the pains of childbirth for moral or religious reasons, but reservations largely resolved after Queen Victoria used chloroform during the birth of Prince Leopoldo in 1853 and Beatrice in 1857. Chloroform became popular for pain relief in the upper classes and became a practical means of anaesthesia in cases

of caesarean section. The introduction of anaesthesia to obstetrics brought pain relief but initially it was a two-edged sword. High-risk obstetric operations gained in popularity and there was an increase in *Accouchement forcé* – the term for violent delivery whatever the risk. These interventions such as forceful dilatation of the cervix, symphysiotomy or pubiotomy increased maternal mortality from haemorrhage and sepsis. Towards the end of the nineteenth century, these procedures waned, as caesarean section became more viable.¹⁵

The techniques of caesarean section were largely unchanged until the 1870s. It was generally believed that suturing the uterine wall was not necessary. Fleetwood Churchill, a British obstetrician, recorded in 1872 ‘no sutures are required in the uterus; as it contracts, the wound will be reduced to 1–2 inches and the lips will come into opposition, if it be healthy’.¹⁷ In 1876, Eduardo Porro, Professor of Obstetrics at Pavia and later Milan, advocated hysterectomy during a caesarean section to control uterine haemorrhage and prevent peritonitis. His procedure contributed to improved maternal mortality, but at the cost of the woman’s future fertility. Prior to Porro, no one in Pavia had survived a caesarean. His first case was a woman, Julia Cavillini, a dwarf primipara of 25 years with a pelvic configuration incapable of permitting a vaginal birth. The procedure, undertaken with chloroform anaesthesia, involved a vertical incision in the uterus and resulted in widespread bleeding. The uterus was amputated above a constrictor and after a turbulent postoperative course, the mother and son survived. The technique was published in Milan the same year and attracted worldwide interest.¹⁸ Harris in 1881 reviewed the world literature and found 50 cases delivered by the Porro method showing a maternal mortality of 58% and a fetal survival of 86%, a major improvement.¹⁹

The first successful caesarean hysterectomy in the USA was performed by Richardson in 1881.²⁰ His patient was also a young dwarf. Godson in 1884 performed the first operation in the UK where mother and baby survived.²¹ In Australia the first successful caesarean section was performed by John Cooke at the Alfred Hospital in Melbourne in 1885. His patient had a cancerous vaginal growth completely occluding the birth canal. The procedure was a classical section in which the mother survived but the infant died shortly afterwards from gastroenteritis. Walter Balls-Headley in 1888 performed the first operation at the Women’s Hospital in Melbourne using the Porro technique.²² English born and trained, he migrated to Australia after contracting tuberculosis and became a leading gynaecologist in Melbourne and honorary physician of the Alfred and Women’s Hospital. He successfully performed the procedure and in gratitude the mother christened her child at the hospital, Porrina Balls-Headley.

In 1882, two German obstetricians, Adolf Kehrer and Max Sänger, independently developed methods for closing the uterine wound using sutures made of silver wire.^{23,24} These sutures were a new material developed in the USA by J. Marion Sims. Sims had advocated the sutures to treat vaginal tears or fistulas from traumatic childbirth. Previously, sutures had to be removed as it was considered impossible to remove them once the abdomen was closed. Sänger

maintained that suturing was essential and the silver material produced little tissue reaction. Sänger preferred the traditional longitudinal uterine incision, whereas Kehrer advocated a low transverse incision at the level of the internal cervical os. He suggested that an incision at this level would improve morbidity because of the natural tendency of the uterus to antelexy. Kehrer’s incision did not become popular until the early twentieth century.

Major advances in asepsis began with the introduction of hand-washing by Semmelweis in 1847 at the Vienna Maternity Hospital. He considered that puerperal fever was carried by medical students who were performing post-mortems in the basement of the hospital. His conclusions about the origins of infection were at first vigorously opposed. Joseph Lister introduced carbolic spray in 1867. The spray in the operating room kept the atmosphere above the wound free of bacteria and away from the open cavities. With improvements in technique and general safety, obstetricians increasingly moved towards performing the procedure rather than waiting for exhaustion of the mother. Practitioners such as Robert Harris in the USA, Thomas Bradford in England and Franz Winckel in Germany argued for an early resort operation.

In 1888, Murdoch Cameron, an obstetrician at the Rotten Row lying-in hospital in Glasgow, performed a caesarean section in a rachitic dwarf with favourable outcome. He noted that the frequent and inappropriate use of forceps in the second stage of labour resulted in poorer outcomes when caesarean section was ultimately performed. Through the combination of anaesthesia, asepsis, suturing and non-interference early in labour, the maternal mortality dropped dramatically. At the beginning of the nineteenth century, it was 65–75% and by the end it had dropped to 5–10%.²⁵

The twentieth century and beyond

In the first decade of the twentieth century, Krönig began operating transperitoneally and retrovesically using a longitudinal incision in an operation he named ‘*der cervikale Kaiserschmitt*’.²⁶ Krönig’s techniques were gradually accepted in Europe and the USA. In 1926, James Munro Kerr, Professor of Obstetrics at Glasgow, advocated the re-introduction of the transverse incision (the Kerr technique), which became preferred to the longitudinal incision (the Krönig technique).²⁷ Several surgeons including Kehrer had utilised the transverse incision in the nineteenth century, but it had not become widespread until the introduction by Kerr. The advantages were less haemorrhage and a reduced risk of uterine rupture during subsequent trials of vaginal delivery. In the USA the vertical lower segment operation was popularised by Beck and DeLee in the 1920s but it was not until the 1940s that the Kerr procedure gained wide acceptance.

A major advance in technique occurred with Frank’s description in 1907 of the extraperitoneal operation.²⁸ This allowed the peritoneal cavity to be sealed before the uterus was opened with a vertical incision. Frank was a strong proponent

of the lower-segment incision because of improved healing. Subsequently, Sellheim in 1908 and Latzko in 1909 modified the procedure to avoid peritoneal entry, thereby preventing peritoneal contamination and risk of sepsis.^{29,30}

Lawson Tait of Birmingham suggested caesarean section for placenta praevia that bled.³¹ This became widely practised although the procedure was often taken up in the third trimester, resulting in the death of many very premature infants. Placenta praevia, especially of major degree, is now a well-recognised indication for elective caesarean section. At the beginning of the twentieth century, the abdominal incisions were increasingly transverse but the fascia was incised longitudinally. Pfannenstiel advocated that the fascia be cut transversally for more secure closure and less postoperative pain.³² Currently, the Pfannenstiel incision is the most commonly employed.

Through the twentieth century, improvements in patient care have established caesarean section as a safe operation both as an emergency and as an elective procedure. From the early twentieth century, blood transfusions became more widely available while the use of sulphonamides (1935) and penicillin (1941) substantially reduced the risk of poor outcomes from sepsis. Ergot alkaloids for uterine contraction and reduction in haemorrhage have been utilised since the early nineteenth century. Oliver Prescott in Massachusetts in 1813 described its use for uterine haemorrhage with extracts of Ergot given by mouth as 'labour tea'. Chassar Moir at University College Hospital performed the isolation of Ergotamine from three alkaloids of crude Ergot in London 1932.³³ Subsequently, administration by the intramuscular route proved successful in reducing post-partum haemorrhage. Oxytocin was first synthesised at Cornell in 1951 and its application for reducing post-partum haemorrhage has increased since that time.³⁴ Advances in anaesthesia including the use of epidural anaesthesia as well as general improvements in nursing and postoperative care have seen mortality rates drop steadily in the western world. Recent studies have demonstrated an overall rate of severe morbidity of 27.3 per 1000 deliveries compared with an overall rate of 9.0 per 1000 planned vaginal deliveries.³⁵

Craigin's famous dictum 'once a caesarean, always a caesarean' first appeared in his paper in a New York medical journal in 1916.³⁶ His presentation before the Eastern Medical Society of the City of New York reflected the conservative view that the only indication for caesarean section was a contracted rachitic pelvis. Craigin's paper came at a time when the operation was still hazardous and performed through classical uterine incisions. Despite the contrary rationale, it has influenced obstetric practice for generations. As recently as 2000, the Australian vaginal birth after caesarean section (VBAC) study group found that only one quarter of women with a previous caesarean scar had a vaginal delivery.³⁷ This is despite the known low risk of uterine rupture in VBACs. As noted by Robson and de Costa, the issue of offering a trial vaginal delivery after a previous caesarean section '... illustrates beautifully the essential tension between evidence-based practice and patient choice and autonomy'.³⁸

Rates for caesarean section have risen dramatically over the last 30 years especially for women in the higher age groups. The increased rates have coincided with the enhanced safety of the operation as well as widespread application of ultrasound and electronic fetal monitoring. The most common indications accounting for this increase are dystocia, repeat caesarean, breech presentation and fetal distress. From some series, repeat caesarean accounts for one third of procedures. In Western countries, Caesarean delivery has become the most commonly performed operation in hospitals. The latest data for Australia indicate an overall rate of 29.4% in 2004 compared with 19.3% in 1995.³⁹ Controversy surrounds these rates of caesarean section and its use for reasons other than medical necessity.⁴⁰ Although the most appropriate rate is unknown, the World Health Organization statement in 1985 advocated a goal of 10–15% of all births in developing countries.⁴¹ The debate on these rates is likely to continue and it is unlikely to be settled by a single interventional trial.

The advances in the techniques of caesarean section combined with developments in medical and nursing care have established the procedure as safe in both the elective and the emergency operations. Improvements in safety have developed in the era of anaesthesia and have been influenced by changing surgical approaches as well as availability of antibiotics and antithrombotic therapy. As a consequence, the indications and motives for caesarean section have changed dramatically from ancient times to the twenty-first century. An operation, which began as a vain rescue attempt for a fetus or for cultural or religious reasons, is now undertaken for the paramount safety of mother and child, but it also considers the mother's wishes and preferences.

References

- 1 Simpson J, Weiner E (eds). *The Oxford English Dictionary*, 2nd edn. Oxford, UK: Oxford University Press, 1989.
- 2 Wolff HJ. *Roman Law: An Historical Introduction*. Norman, OK: University of Oklahoma Press, 1951.
- 3 Health JF (trans). *Pliny the Elder, Natural History: A Selection*. London: Penguin Books, 1991.
- 4 Rosner F (trans). *Maimonides, Medical Writings*. Haifa, Israel: KTAV publishing, 1984.
- 5 Temkin O (trans). *Soranus. Gynaecology*. Baltimore, MD: The Johns Hopkins Press, 1956.
- 6 Todman D. Childbirth in Ancient Rome: From traditional folklore to obstetrics. *Aust N Z J Obstet Gynaecol* 2007; 47: 82–85.
- 7 Kühn KG. *Claudii Galeni. Opera Omni*. Leipzig, Germany: C Knobloch, vol. 5, 1821–1833.
- 8 Hallam E, ed. *Saints: Who They are and How They Help You*. New York: Simon & Schuster, 1994.
- 9 William S. *Macbeth*. Hunter GK, ed. London: Penguin Classics, 1981.
- 10 Trolle D. *The History of Caesarean Section*. Copenhagen, Denmark: CA Reitzel, 1982.
- 11 Reiss H. Abdominal delivery in the 16th century. *J Royal Soc Med* 2003; 96: 370.

- 12 Guillemeau J. *Childbirth or the Happy Delivery of Women*. London: A Hatfield, 1612.
- 13 Jackson I, Park K, eds. *Andreas Versalius de Humani Corpus Fabrica (CD-ROM)*. Basel, Switzerland: The Warnock Library, 1998.
- 14 Wilson A. *The Making of Man-Midwifery. Childbirth in England, 1660-1770*. Cambridge, MA: Harvard University Press, 1995.
- 15 Carter C, Durietz T. *With Child. Birth Through the Ages*. Edinburgh, UK: Mainstream Publishing, 1986.
- 16 Gordon HL. *Sir James Young Simpson and Chloroform*. New York: Longmans, Green and Co., 1898.
- 17 Churchill F. *Theory and Practice of Midwifery*, 6th edn. Philadelphia, PA: Lea and Blanchard, 1872.
- 18 Porro E. *Della Amputazione Utero-Ovarica Come Complemento de Taglio Cesareo*. Milan, Italy: Frat Rechiedei, 1876.
- 19 Harris RP. Special statistics of the caesarean section in the United States. *Am J Obstet* 1881; **144**: 341-361.
- 20 Young JH. *The History of Caesarean Section*. London: Lewis, 1944.
- 21 Godson C. Porro's operation. *Br Med J* 1884; **1**: 142.
- 22 Forster FMC. Caesarean section and its early Australian history. *Med J Aust* 1970; **2**: 33-37.
- 23 Kehrer FA. Ueber ein Modificirtes Verfahren beim Kaiserschnitt. *Arch Gynaek* 1882; **19**: 177-209.
- 24 Sanger M. *Der Kaiserschnitt bei Uterusfibromen*. Leipzig, Germany: G. Thieme, 1882.
- 25 Munro Kerr JM, ed. *Historical Review of British Obstetrics and Gynaecology*. London: E & S Livingstone, 1954.
- 26 Kronig B. *Transperitoneale Cervikaler Kaiserschnitt*. In: Doderlein A, Kronig B, eds. *Operative Gynakologie*. Leipzig, Germany: G. Thieme, 1912.
- 27 Kerr JMM. The technic of Caesarean section with special reference to the lower uterine segment incision. *Am J Obstet Gynaecol* 1926; **12**: 726.
- 28 Frank F. Suprasymphysial delivery and its relation to other operations in the presence of a contracted pelvis. *Arch Gynaecol* 1907; **81**: 46.
- 29 Sellheim H. Der extraperitonealan Uterusschnitt. *Zbl Gynak* 1908; **32**: 133-142.
- 30 Latzow W. Der extraperitoneale Kaiserschnitt, seine Geschichte, seine Technik und seine Indikationen. *Wien Klin Wochenschr* 1909; **81**: 46.
- 31 Tait L. Address on the surgical aspect of impacted labour. *Br Med J* 1890; **1**: 657.
- 32 Pfannenstiel HJ. Uber die Vortheile des Suprasymphysaren Fascien-querschnitts fur die Gynakologischen Koliotomien zugleich ein Beitrag zu der Iindikationsstellung der Operationswege. *Samml Klin Votr Leipzig* 1900; **268**: 1735-1756.
- 33 Chasser-Moir J. The action of ergot preparations on the puerperal uterus. *Brit Med J* 1932: 1119-1122.
- 34 Du Vigneaud V, Ressler C, Swan JM, Roberts CW, Katsoyannis PG, Gordon S. The synthesis of an oxypeptide with the hormonal activity of an oxytocin. *J Am Chem Soc* 1953; **75**: 4879-4880.
- 35 Shiliange L. Maternal mortality and severe morbidity associated with low risk planned caesarean delivery versus planned vaginal delivery at term. *Can Med Assoc J* 2007; **176**: 4.
- 36 Craigin EB. Conservatism in obstetrics. *NY Med J* 1916; **104**: 1-3.
- 37 Appleton B, Targett C, Rasmussen M, Readman E, Sale F, Permezel M. Vaginal birth after caesarean section: An Australian Multicentre Study. VBAC Study Group. *Aust N Z J Obstet Gynaecol* 2000; **40**: 87-91.
- 38 Robson S, de Costa C. Vaginal birth after a previous caesarean section: Where evidence-based practice and patient choice collide. *O&G* 2004; **6**: 191-192.
- 39 Australian Institute of Health and Welfare. *Australian Mothers and Babies 2004*. [Cited 23 March 2007] Available from URL <http://www.npsu.unsw.edu.au/ps18high.htm>.
- 40 Dietz HP, Peek MJ. Will there ever be an end to the Caesarean section rate debate. *Aust N Z J Obstet Gynaecol* 2004; **44**: 103.
- 41 World Health Organization (WHO). *Consensus Conference on Appropriate Technology for Birth*; 1985, 22-26 April; Fortaleza, Brazil. Geneva, Switzerland: WHO, 1985.