



Coffin birth

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Coffin birth, known in academia by the more accurate term **postmortem fetal extrusion**,^{[1][2]} is the expulsion of a nonviable fetus through the vaginal opening of the decomposing body of a deceased pregnant woman as a result of the increasing pressure of intra-abdominal gases. This kind of postmortem delivery occurs very rarely during the decomposition of a body. The practice of chemical preservation, whereby chemical preservatives and disinfectant solutions are pumped into a body to replace natural body fluids (and the bacteria that reside therein), have made the occurrence of "coffin birth" so rare that the topic is rarely mentioned in international medical discourse.

Typically during the decomposition of a human body, naturally occurring bacteria in the organs of the abdominal cavity (such as the stomach and intestines) generate gases as by-products of metabolism, which causes the body to swell. In some cases, the confined pressure of the gases can squeeze the uterus (the womb), even forcing it downward, and it may turn inside-out and be forced out of the body through the vaginal opening (a process called *prolapse*). If a fetus is contained within the uterus, it could therefore be expelled from the mother's body through the vaginal opening when the uterus turns inside-out, in a process that, to outward appearances, mimics childbirth. The main differences lie in the state of the mother and fetus and the mechanism of delivery: in the event of natural, live childbirth, the mother's contractions encourage the infant to emerge from the womb; in a case of coffin birth, built-up gas pressure within the putrefied body of a pregnant woman pushes the dead fetus from the body of the mother.

Cases have been recorded by medical authorities since the 16th century, though some archaeological cases provide evidence for its occurrence in many periods of human history. While cases of postmortem fetal expulsion have always been rare, the phenomenon has been recorded under disparate circumstances and is occasionally seen in a modern forensic context when the body of a pregnant woman lies undisturbed and undiscovered for some time following death. There are numerous examples that have demonstrated that the term *coffin birth* is a misnomer under many circumstances. There are also cases whereby a fetus may become separated from the body of the pregnant woman about the time of death or during decomposition, though because those cases are not consistent with the processes described here, they are not considered true cases of postmortem fetal extrusion.

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Causes

The etiology^{Note a} of postmortem fetal extrusion is not completely understood, as the event is neither predictable nor replicable under experimental conditions. Evidence has accumulated opportunistically and direct observation is serendipitous.^[2] While it is possible that more than one cause can produce the same result, there is an accepted hypothesis,^{[2][3]} based on established research in the fields of biochemistry and forensic taphonomy,^{Note b[4]} and further supported by observational research, that accounts for the taphonomic mechanisms that would result in the most often encountered cases of postmortem extrusion of a nonviable fetus.

Stages of death

1. Pallor mortis
2. Algor mortis
3. Rigor mortis
4. Livor mortis
5. Putrefaction
6. Decomposition
7. Skeletonization

Typically, as a dead body decomposes, body tissues become depleted of oxygen and the body begins to putrefy; anaerobic bacteria in the gastrointestinal tract proliferate and as a result of increased metabolic activity, release gases such as carbon dioxide, methane, and hydrogen sulfide.^{[5][6]} These bacteria secrete exoenzymes^{Note c} to break down body cells and proteins for ingestion which thus weakens organ tissues. Increasing pressure forces the diffusion of excessive gases into the weakened tissues where they enter the circulatory system and spread to other parts of the body, causing both torso and limbs to become bloated. These decompositional processes weaken the structural integrity of organs by separating necrotizing tissue layers.^[6] Bloating usually begins from two to five days after death, depending on external temperature, humidity, and other environmental conditions.^[7] As the volume of gas increases, the pressure begins to force various body fluids to exude from all natural orifices.^[8] It is at this point during the decomposition of a pregnant body that amniotic membranes become stretched and separated, and intraabdominal gas pressure may force the eversion and prolapse of the uterus,^{Note d} which would result in the expulsion of the fetus through the vaginal canal.^[9] It has been observed that the bodies of multiparous women^{Note e} are more likely to spontaneously expel the fetus during decomposition than those who died during their first pregnancy, because of the more elastic nature of the cervix.^[10]

History

Numerous documented cases of postmortem fetal extrusion were described in the medical compendium *Anomalies and Curiosities of Medicine*, first published in 1896.^[3] The earliest presented case occurred in 1551 when a pregnant woman was tried and hanged by the courts of the Spanish Inquisition. Four hours after her death, and while the body still hung by the neck, two dead infants were seen to fall free of the body. This is unusual for the short amount of time elapsed between death and the postmortem delivery. As no information is given regarding other ambient circumstances, it is unclear whether the onset of putrefaction was accelerated, or if other causal factors were at work.^[4] In the city of Brussels, in 1633, a woman died in convulsions and three days later the fetus was spontaneously expelled. In Weissenfels, in 1861, postmortem fetal extrusion was observed sixty hours after the death of a pregnant woman. Other

cases are described, though only a few describe the unexpected discovery of fetal remains following exhumation. Most cases occurred prior to burial; in some of these, the body was in the casket while in other cases the body was still on its deathbed or on a bier.^[3]

During the late 19th century, modern embalming techniques were developed, whereby preservative and disinfectant chemical compounds (such as formaldehyde) are pumped into a body, flushing out the body's natural fluids, and with them the bacteria that flourish during putrefaction and generate the gases that comprise the active force behind the expulsion of the fetus.^[11] However, the phenomenon was still recognized by medical science and in 1904, John Whitridge Williams wrote a textbook on obstetric medicine that included a section on "coffin birth".^[10] Although the text has remained an important reference in obstetrics, the subject, whether called "coffin birth" or "postmortem fetal extrusion", was excluded by its 13th edition in 1966,^[12] and was not mentioned in the edition published in 2009.^[13] The subject was discussed in German medical literature during the 20th century,^{[14][15][16][17]} though more detailed case reports in the forensic literature have been published recently.^{[1][2]}

In 2005, the body of a 34-year-old woman, eight months pregnant, was discovered in her apartment in Hamburg, Germany.^[2] The body was bloated and discolored, and upon initial examination, it was found that the head of the fetus had made its appearance in the vaginal opening. At autopsy, medical examiners found that both the head and shoulders of the fetus had emerged, and concluded that it was a case of postmortem fetal extrusion in progress. The woman, who had given birth twice before, had died of a heroin overdose.^[2] The case was unusual and serendipitous, as few medical practitioners have been able to observe and document the progress of postmortem fetal extrusion.

In 2008, the body of a 38-year-old woman, seven months pregnant, was discovered in an open field four days after she had disappeared from her residence in Panama.^[1] A plastic bag had been left over her head, and she had been gagged; the case was ruled a homicide. The body had suffered from the tropical heat and high humidity, and was bloated and highly discolored. At autopsy, the remains of the fetus were discovered in the woman's undergarments.^{Note f} Although the fetus was in a similar state of decomposition, the umbilical cord was intact and still attached to the placenta inside the uterus.^[1]

Bioarchaeology

Postmortem fetal extrusion can be very difficult to recognize once a body has undergone complete skeletonization, and bioarchaeologists are often very cautious about asserting the presence of this phenomenon.^{[18][19]} There are numerous cultural reasons why a mother and an infant might be interred together, so the joint presence of neonatal remains and an adult female is not taken as conclusive evidence of postmortem fetal extrusion;^{[18][19]} however, there have been excavated burials where the position of a set of fetal remains relative to those of an adult female supported this hypothesis. There are a few general guidelines when an archaeologist is assessing the placement of the fetus and the adult:^[18]

1. If the fetal remains are found in a fetal position and are wholly within the pelvic cavity of the adult, the fetus died and was interred prior to delivery. The pregnant woman may therefore have died due to labor complications.

2. If the infant is found alongside the adult, with the head oriented in the same direction as the adult, then the infant was delivered, whether naturally or by caesarian incision, at about the time of death, and thereafter interred.
 1. Delivered infants have also been interred between or alongside the tibiae (shins), but the infant is still oriented in the same direction as the adult.
 2. If the majority of the fetal remains are in the pelvic cavity of the adult, yet the legs are extended and/or the cranium lies among the ribs, then the infant may have been delivered and then placed on top of the mother's torso prior to burial. As both bodies skeletonized, the infant's bones would have settled among the mother's ribs and vertebrae.
3. If the fetal remains are complete and in a position inferior to and in-line with the pelvic outlet, with the head oriented opposite to that of the mother (toward the foot of the coffin or grave), then there is the possibility of coffin birth.^{[18][20]}
 1. Evidence for postmortem fetal extrusion may be less ambiguous when the fetal remains are found to lie within the pelvic outlet of the adult, thus indicating that partial extrusion had occurred during decomposition.^{[21][22]}

In 1975, it was reported that during the excavation of a medieval cemetery in Kings Worthy, England, fetal remains appeared to lie within the birth canal of the skeleton of a young woman, with the fetal cranium external to the pelvic outlet and between the two femora (thigh bones) and the fetal leg bones clearly within the pelvic cavity.^[21] Other cases of coffin birth at archaeological sites have been described, such as in 1978 at a Neolithic site in Germany,^[23] at a medieval site in Denmark in 1982,^[22] and in 2009 at an Early Christian period site at Fingal, Ireland.^[20] A coffin birth was also described in a 2011 episode of the BBC show *History Cold Case*, featuring the Roman era remains of a woman and three neonates discovered near Baldock, Hertfordshire.^[24]

Applicability of diagnosis

Because postmortem fetal extrusion is so rare, and occurs under highly idiosyncratic conditions regarding the individual and the ambient environment,^{[3][5][10][18]} this phenomenon has not been studied for possible applications to forensic investigation. Even if the study of postmortem fetal extrusion could lead to improved investigative methods, experimental research would be highly problematic. At present, forensic scientists have at their disposal an array of established techniques and procedures for a death investigation at the stages of decomposition when postmortem fetal extrusion typically occurs.^[9]

In archaeology, the study of mortuary context, that is, the interpretation of the postmortem treatment of the dead, whether an individual or as pertains to patterns within a group, has led to the development of hypotheses on social status and/or hierarchy regarding many cultures, ancient and extant.^{[22][25][26][27][28]} In addition, the determination of whether or not delivery actually occurred prior to death has a bearing on analyses of the mother's population, as the concentration of trace elements differ markedly between the skeletons of prepartum adult women (before giving birth) and women who are lactating; the identification of coffin birth would lead to more accurate analyses of the number of lactating women in a population or the rate of maternal mortality.^[29] It is therefore necessary for investigators to be able to recognize postmortem fetal extrusion when encountered in an excavated burial.^{[19][30]}

Comparable phenomena

There are also many cases where the remains of the fetus are found separate from the body of the mother, but expulsion was not through the birth canal, and separation of the two bodies may have been influenced by external environmental factors. The process of separation is so unusual that a specific term for the phenomenon may not have been proposed to the scientific community. These cases may have comparable results, but they are not cases of postmortem fetal extrusion.

In April 2003, the body of Laci Peterson washed up on a shore near San Francisco Bay; she had been pregnant when she disappeared four months earlier, and the fetus she had been carrying was discovered on a separate beach. When questioned by the media, medical authorities initially speculated that a "coffin birth" might have occurred.^[31] However, at autopsy the cervix was found to be in a parturition condition. Medical examiners later concluded that while Peterson's body was in the bay, the skin over the abdominal cavity had ruptured due to natural decompositional processes. Seawater entered the abdominal cavity and washed out most of the internal organs, along with the fetus.^[32]

In 2007, a 23-year-old woman in India, over eight months pregnant, hanged herself after contractions had begun.^[33] A viable infant was spontaneously delivered unassisted from the woman's body, which was suspended by the neck. The healthy infant was found on the floor, still tethered to the body of the mother by the umbilical cord. The primary cause of the delivery was the otherwise normal contractions, which had begun prior to death, and was therefore not related to processes of decomposition.^{[6][33]} While this is not postmortem fetal extrusion, it may be referred to as a case of *postmortem delivery*, a term which is applied to a broad range of techniques and phenomena with a resultant delivery of a live infant.^[34]

In 2008, it was reported from Germany that a 23-year-old woman in her third trimester was involved in a motor vehicle accident and died; the nonviable fetus was found between her feet.^[35] Following initial impact the vehicle she was in caught fire. The woman was unable to escape due to internal injuries and burned to death. Investigators came to the conclusion that the extreme heat of the fire burned away epidermal and subcutaneous tissue around the abdominal cavity, after which the anterior aspect of the uterus ruptured, causing the fetus to spill out of the uterine cavity and land on the floor between the woman's feet. The umbilical cord was still intact and connected the fetus to the placenta through the ruptured wall of the uterus. Unlike the woman, who suffered fourth-degree burns over her entire body, the body of the fetus was relatively undamaged.^[35] Because the primary cause of separation from the mother's body was thermally induced traumatic rupture of the abdominal and uterine cavities; traumatic separation was not related to normal decompositional processes; and expulsion of the fetus did not involve passage through the birth canal, this is not considered a case of postmortem fetal extrusion.^[35]

See also

- Childbirth
- Osteology
- Posthumous birth
- Stillbirth

Footnotes

- a.^ That is, the uterus could be forced partially or completely inside-out (*eversion*), and fall or be forced out of the vaginal opening (*prolapse*).
- b.^ The *etiology* is a study of the specific processes and conditions that result in a particular medical condition.
- c.^ *Forensic taphonomy* is the study of the processes of decomposition.
- d.^ *Exoenzymes* are enzymes that function outside the cell membranes of bacteria.
- e.^ *Multiparous women* are those who have experienced vaginal childbirth two or more times.
- f.^ See the website Documenting Reality: Postmortem Fetal Extrusion (<http://www.documentingreality.com/forum/fl0/postmortem-fetal-extrusion-36857/>) for photos of this case from the article by Lasso *et al.* 2009.^[1]

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