of the sacrum encroaches less upon the pelvic inlet; the true pelvis is shorter but more roomy, and its outlet is absolutely as well as relatively wider; the sacrum is wider and shorter, and its curvature less marked; the ischiac spines encroach less upon the cavity; the pubic arch is wider and less angular, and its edges are everted; and the tuberosities of the ischia and the acetabula are wider apart. In the male, the entire pelvis is more massive, the eminences and depressions for muscular attachments are more marked, the pelvic cavity is deeper and narrower, and the obturator foramina are larger and more oval (less triangular) in shape.

The following average measurements of the true pelvis are taken from Toldt, and, in the determination of sex, are to be regarded relatively, since individual measurements may vary markedly in the same sex:

| Part. | Diameter. | Female. | Male. |
|---|---|---|---|
| Inlet | Antero-posterior. | 118 mm. = 4.72 in. | 113 mm. = 4.52 in. |
| | Transverse | 135 " = 5.4 " | 127 " = 5.08 " |
| | Oblique | 124 " = 4.96 " | 120 " = 4.8 " |
| Cavity | Antero-posterior. | 126 " = 5.04 " | 114 " = 4.56 " |
| | Transverse | 120 " = 4.8 " | 109 " = 4.36 " |
| Outlet | Antero-posterior. | 90–110 " = 3.6–4.4 " | 75–95 " = 3–3.8 " |
| | Transverse | 110 " = 4.4 " | 82 " = 3.28 " |

*Height.*—The relaxation of the ligaments and other tissues following death, more especially after rigor mortis has ceased and decomposition has commenced, taken in connection with swelling or emphysema of the scalp, might be responsible for a slight increase in height post mortem. The mode of measuring the height is as follows: The cadaver is laid out straight upon a flat surface, and the measurement is made between the perpendicular line dropped from the top of the vertex and the plantar surface of the heel, the foot being at right angles with the leg. In certain cases it is desirable to estimate the total height of a body of which only isolated parts are available. The following proportions will be found useful as a basis for making such a calculation: The distance between the tips of the middle fingers, the upper extremities being extended at right angles to the trunk, equals the height. If an upper extremity alone is at hand, its length doubled plus the distance between the two glenoid surfaces would give the height. How much should be allowed for this latter distance is difficult to estimate. The length of the two clavicles plus that of the interclavicular notch—a total which would average twelve inches—would be too much, and consequently the total height of the body, estimated according to this formula, would also be too great.

Other formulæ are the following: The length of the middle finger is one-nineteenth of the height; the length of the forearm, from the tip of the olecranon to the tip of the middle finger, is five-nineteenths of the height; the upper border of the symphysis pubis is about the middle point of the total length of the body, after full growth; the length of the lower extremity, from the head of the femur to the plantar surface of the heel, is about one-half the height (according to Orfila, the lower part, measuring from the symphysis, is shorter, by an average of two and one-third inches, than the upper, especially in women); the length of the femur is about one-fourth of the total height, after full growth.

Tables of the relative proportions of the dimensions of single bones to the total height are given by Orfila, Toldt, and others. For the determination of the total height from single bones the age must be known. In exceptional cases the age may be determined from single bones, and in such cases comparison of measurements with standard tables may be found very useful in estimating total height. However, the proportions given above are practically as reliable as the data furnished in these tables.

*Age.*—The most important points upon which estimates in regard to age—at least up to the time of complete growth—may be based, are the appearance of the centres of ossification, the progress which they have made toward complete ossification, and their final union with neighboring centres. In young subjects the examination of the teeth warrants important conclusions. The results of anatomical investigation are too extensive to be included in the present article.

Conclusions based upon the height of the cadaver are less reliable. If we take 50 cm. as the average height at birth, in five years this height will be doubled (100 cm.). In the first year the increase amounts to from 1 to 2 cm. a month, or from 12 to 24 cm. for the year. After the first year the increase varies from 7 to 8 cm. for each year. During the ten years following the first five the height increases to thrice that at birth (*i.e.*, to 150 cm.), averaging 5 cm. for each year in the ten. At puberty, growth is again more rapid, up to the eighteenth year, and then again it proceeds more slowly up to the time of complete growth; the usual height attained by males being from 157 to 180 cm., while that attained by females amounts to from 153 to 166 cm. (Hofmann).

Care should be taken lest premature loss of hair, grayness, loss of teeth, or marasmus lead one into error in estimating age. The senile increase in the angle between the body and the ramus of the inferior maxilla, the atrophy of the alveolar processes, and the decrease in the angle between neck and shaft of the femur are important indications of advanced age.

The general condition of the cadaver—whether obese, well, or poorly nourished, or thin or marantic—may afford important aid in the work of identification.

The appearances produced by putrefaction should not be confused with obesity, or those due to mummification with marasmus or with advanced age. The appearance of nutrition may be completely changed in cadavers after exposure to flame, and due allowance should be made therefor.

In regard to the color of the hair in exhumed cadavers, it has been found that it changes to a reddish brown, the effect of exposure to putrefactive substances or to the soil. Time alone will change the color of dead hair, as may be seen in wigs and in the hair of Egyptian mummies. Heat causes a change of color toward a reddish tint.

Special marks for identification—teeth, moles, warts, scars, and tattoo marks—should be accurately described. Tattoo marks may disappear. According to Caspar, this happens once in nine cases; according to Hutin, once in ten and a half cases; and according to Tardieu, once in twenty-five cases. Soluble pigments are more likely to disappear. Even insoluble pigments may be carried through the lymphatics and lodge in the peripheral parts of neighboring lymph nodes.

The appearance of the hands and finger nails, or the presence of callosities, stains, etc., may warrant a shrewd guess as to occupation. *Otto H. Schultze.*

**CADE, OIL OF.**—Oleum Cadinum. *Oleum Juniperi Empyreumaticum.* "A product of the dry distillation of the wood of *Juniperus Oxycedrus* L. (fam. *Coniferæ*)" (U. S. P.). The British Pharmacopœia includes "some other species" in the source.

*J. Oxycedrus* resembles in general the common juniper of Europe, but has larger, reddish-brown, shining fruits (1.25 cm. in diameter—0.5 in.). It is an inhabitant of the Mediterranean basin, growing in waste places and upon stony hillsides.

Its tar has been used for centuries by the peasants of Southern France for the "sheep itch" and other cutaneous affections of their cattle, but its employment in medicine, although occasional and also of old date, has only been extensive since its recommendation by the German school of dermatologists in the treatment of eczemas. It is prepared by a method similar to that used in the manufacture of ordinary tar; that is, by distillation *per descensum*, in rude stills or ovens, from the bottom of which it is collected and then sold without further purification. The principal centre of its production is Nîmes.

It is a thin tar, often black in mass, but brown or brownish yellow and transparent, in thin layers; and is more fragrant and pleasant in odor than common wood tar, which it otherwise resembles. The taste is acrid and empyreumatic. Its composition is not notably different from that of the tars of other conifers. *Cadinene* ($C_{15}H_{24}$) is its important odorous constituent. The principal use to which it is put in medicine is that mentioned above—for the local treatment of eczema in the scaly stage. It is also used in other chronic inflammatory and exfoliating skin diseases. It may be applied by rubbing in with the fingers or a cloth, or, what is better, with a stiff-haired brush. If desirable to dilute it, some bland oil may be mixed with it, or it may be made into an ointment with lard or tallow, or with vaseline. Soaps containing it are also considerably used. Stockings, gloves, and bandages saturated with it are sometimes worn. Besides its stimulating properties, oil of cade is a good parasiticide, an efficient antiseptic, and a local anæsthetic—properties which it undoubtedly owes to the creosote and similar substances which it contains. It is never used internally. *W. P. Bolles.*





**CADMIUM.**—*Cadmium Sulphate* is the only salt of this metal that merits notice in medicinal relation. It was official in the United States Pharmacopœia of 1870, and, though dropped in the revision of 1880, it is still considerably employed. The salt, formula $CdSO_4,4H_2O$, occurs in small colorless, rhomboidal crystals, efflorescent on exposure. It is freely soluble in water, and has a subacid and astringent and metallic taste. In properties it most closely resembles zinc sulphate, being an irritant astringent. Taken internally, it will determine vomiting, after the manner of zinc sulphate, and in overdose will prove poisonous. Its claim for recognition in medicine rests on an alleged peculiar potency in determining the absorption of such corneal opacities as are capable of undergoing that process—a potency certainly not much, if at all, greater than that possessed by the commoner salts, silver nitrate or zinc sulphate.

Cadmium sulphate is generally used in solution of from one-half to one per-cent. strength. *Edward Curtis.*

**CADMIUM, POISONING BY.**—Cadmium and its salts are comparatively unimportant from a medico-legal point of view. Their uses are limited, and they are seldom met with outside of the chemical laboratory. The metal is employed occasionally in alloys to reduce their fusing point, and an amalgam has been used by dentists for filling teeth. The most important compounds are the iodide and bromide, which are used in photography for iodizing and bromizing collodion. The sulphate of cadmium has been recommended, used internally, in the treatment of syphilis, rheumatism, and gout (Grimaud). It has been chiefly used externally, however, as an astringent and stimulant, in the treatment of conjunctivitis, and ulcers and opacities of the cornea. The iodide of cadmium, in the form of an ointment, has been recommended for external use, particularly in the treatment of scrofulous enlargement of the glands (Garrod, Guibert). The sulphide of cadmium has been used, to a limited extent, as a yellow pigment. Excepting the sulphide, the compounds mentioned are colorless, soluble in water, and possess a disagreeable metallic taste.

Symptoms.—Preparations of cadmium have given rise, occasionally, to accidental poisoning. They appear to act as irritants, resembling in general the salts of zinc. Sixty milligrams (0.9 grain) of the sulphate, taken internally, caused in one hour salivation, colic, and diarrhœa; and after four hours, vomiting accompanied by intense gastralgia and tenesmus (Burdach). Vomiting, diarrhœa, vertigo, labored respiration, loss of strength, and cramps followed the inhalation of the dust arising from a polishing powder containing carbonate of cadmium (Sovet). Two ladies took an uncertain but small dose of bromide of cadmium by mistake for bromide of ammonium. It caused severe pain and a burning sensation in the stomach, accompanied by vomiting and purging which lasted for five hours. During a part of this time the pulse was imperceptible. There were no cerebral symptoms. Both patients were confined to their beds for several days, during which time their stomachs continued irritable (Wheeler). There is only one fatal case of cadmium poisoning recorded, so far as the writer has been able to learn. The patient, a lad fourteen years of age, took an unknown but probably large dose of chloride of cadmium, which had been sold for Epsom salts. It caused immediate vomiting. On admission to the hospital a short time after, he was in a state of collapse, with cold, clammy skin; radial pulse scarcely perceptible; respiration feeble, slow, and sighing. There was no stertor. The mucous membrane of the mouth was pale and sodden, the tongue greatly swollen. He was apparently unconscious, though when shaken and aroused by dashing cold water upon the face, he replied rationally, in a hoarse whisper, to any questions put to him. There was extreme restlessness. Deglutition was impeded. Death took place in about an hour and a half after the ingestion of the poison. At the post-mortem examination the vessels of the brain were found filled with blood; the left lung congested (Mr. J. Hinder, *Indian Medical Gazette*, Calcutta, 1866, i., 156).

*Experiments on Animals.*—Marmé has studied the action of the salts of cadmium by experiments on animals. He concludes that the sulphide is non-poisonous. Administered to animals with their food for a week, in doses of many drachms, it caused no inconvenience. Its insolubility in water, weak acids, alkaline salts, and oil renders its use as a pigment free from danger. All compounds of cadmium which are soluble in water or weak acids at the temperature of the body are poisonous. Taken into the stomach they cause, in small doses, vomiting; in large doses, all the symptoms of gastro-enteritis. If quantities sufficiently large to be poisonous, without causing death rapidly, are injected beneath the skin or into the blood-vessels, they produce inflammation of the stomach and intestines, and frequently hemorrhages, erosions, and ulcerations. Small doses injected into the blood-vessels are fatal to animals. Thirty milligrams (0.5 grain) killed a dog; 16 mgm., a cat; 10 to 20 mgm., a rabbit; 30 to 60 mgm. (0.5 to 0.9 gr.), administered by the mouth, killed a rabbit weighing 1,500 to 1,800 gm. (3.3 to 3.9 lbs. avoir.). The repeated absorption of small doses may give rise to chronic poisoning, which, in animals, is characterized by disturbed digestion, emaciation, and death. The post-mortem appearances observed were: a more or less extensive gastro-enteritis, sometimes subpleural hemorrhages, infarctions of the lungs, frequently fatty degeneration of the liver and heart, and diffuse nephritis. Elimination commences very soon and takes place chiefly through the kidneys. After death, cadmium can be detected in the blood, heart, liver, and kidneys.

Treatment.—This should be much the same as in cases of poisoning by salts of zinc. Vomiting should be assisted, if necessary, by the free administration of warm water, with milk or mucilaginous liquids; or the stomach may be emptied by means of the stomach pump. The subsequent irritation may be allayed by the use of opium. Marmé recommends, in cases of acute poisoning, the alkaline carbonates with white of eggs. The subcutaneous injection of dilute solutions of soda, when employed early, was found, in the case of animals, completely to arrest the poisonous action of the cadmium salts. *William B. Hills.*

**CÆCUM, DISEASES OF.** See *Appendicitis; Colitis;* and *Colon, Surgery of the.*

**CÆSAREAN SECTION.**—Cæsarean section is a term used for operations which remove a fœtus from the uterus through the abdominal wall, the peritoneal cavity being opened in all cases. Historically it is one of the oldest of obstetrical operations recorded.

It is generally supposed to have received its name from Cæsar, who was believed to have been born by abdominal section. But, whether this be true or not, it was performed many years before his time. Furthermore, the

name, according to Pliny, was derived from the Latin *cædare*, "to cut," which makes the term Cæsarean section rather meaningless and the use of the capital C inappropriate, but usage gives it a definite meaning and place.

Until the Middle Ages the operation was largely performed only to deliver a child when the mother was dying. The Roman laws forbade the burial of a pregnant woman until the child had been removed. The first performance of the operation on a living woman which is recorded was in 1500 A.D., the operator being a butcher named Jacob Nufer, in Switzerland. In Germany, Trautmann, of Wittenberg, inaugurated the procedure in the year 1610. The patient lived three weeks.

Until the advent of antiseptic surgery in recent times the mortality following the operation was too great to encourage its employment in any but extreme circumstances.

Until the introduction of recent modifications the various steps in the operation were: 1. Section of the abdominal wall, usually in the median line between the pubes and umbilicus. 2. Section of the uterus *in situ*, the incision being made upon the middle, anterior surface from above downward. 3. Removal of the child and placenta. 4. In some cases suturing of the uterine wound, and in others leaving it to close by general contraction of the uterus; and suturing of the abdominal wound.

From a historical standpoint the most interesting question has been the treatment of the uterine wound. So recent a work as Cazeaux and Tarnier's, seventh edition, 1884, states that, "the wound in the uterus requires no other attention than that of being well cleansed"; while Playfair, third American edition, 1880, considers the question of suture "a mooted point." To Kehrer ("Ueber ein modificirtes Verfahren beim Kaiserschnitte," *Arch. f. Gynäk.*, vol. xix., p. 177, Berlin, 1882), Sänger ("Der Kaiserschnitt bei Uterus-Fibromen nebst vergleichender Methodik der Sectio-Cæsarea und Porro-Operation," Leipsic, 1882), and Leopold ("Ein Kaiserschnitt mit Uterusnaht nach Unterminirung der Serosa und Resection der Muscularis"; "Zwei weitere glückliche Kaiserschnitte," etc., *Arch. f. Gynäk.*, vol. xix., p. 400, 1882, and vol. xxiv., p. 427, 1884), belong the chief credit for the improvement in the treatment of the uterine wound which has rendered the present splendid results possible.

The three improvements that have brought the mortality of Cæsarean section from nearly one hundred per cent. to about five per cent. are: antisepsis and asepsis; complete muscular and serous suturing; coaptation in the uterine wound, and operation at the selected time, instead of when patients were mostly moribund, or exhausted by long labors; and the Porro hysterectomy.

*Methods of Operating.*—The Sänger Cæsarean section. To Sänger has been awarded the honor of title of the simple cœlio-hysterotomy form of Cæsarean section. For performing this operation the patient is prepared as for any abdominal section. The urine should be carefully tested, the bowels thoroughly emptied, the abdomen washed with green soap and alcohol or ether, and bound with gauze (1 to 1,000 bichloride) twelve hours before operating. The pubes should be shaved, and the vulva and vagina made as aseptic as possible. This latter is best accomplished by first douching with hot bichloride solution and by dusting boric-acid powder into all the crevices of the introitus vaginæ and the vulva. The urine should after this be drawn with a soft catheter. The instruments needed are: scalpels, two mouse-toothed dissecting forceps, one dozen artery forceps, scissors, long-curved needles, as well as some that are small and short, needle-holders, sutures of medium-sized silk, silkworm gut, and catgut; two pieces of either solid rubber ligatures or tubing, each about eighteen inches long; several pedicle clamps; right and left aneurism needles, and one large vulsella forceps.

*When to Operate.*—There are some advantages in operating when the patient is in labor, the choice moment being when the uterus is awakened to active rhythmic pains, but previous to any exhaustion.

There is less liability to failure of the uterus to contract after section and removal of its contents. The cervix is also more succulent, and will permit delivery of the placenta *per vias naturales* if that proves best. On the other hand, it is difficult to make as thorough preparation for operation and perform it before any exhaustion of the patient occurs, if the time is decided by the occurrence of labor, which may be at an inconvenient hour. Generally, when the operation has already been decided upon, the operator selects his time. This time should, of course, be as near term as possible, unless there are special indications to the contrary.

*Steps of the Operation.*—The abdominal incision is made in the median line, running from one inch and a half below the umbilicus to just above the pubes. Usually the uterus lies in contact with the abdominal wall, the omentum and intestines being above and somewhat to the left of that body, but it is not wise to assume this and cut at one stroke through the abdominal wall. There is no need of such effort at speed.

There are at this stage two methods of handling the uterus: one to incise it *in situ*, and the other to lift it out of the abdominal cavity and then incise it. The first method can be used when the uterus is free from infection and the fœtus of moderate size. It has the advantage of requiring less length of incision in the abdominal wall than the second method, and of causing less exposure and displacement of the intestines. The second method has the advantage of more thoroughly keeping the fluids from the uterus out of the abdominal cavity, and permits better control of uterine hemorrhage. There are also two methods employed for the control of hemorrhage. By one the uterus is constricted by means of a rubber ligature (this is about one-eighth of an inch thick and eighteen inches long), or by rubber tubing, which is passed around the lower portion of the uterus, and either tied tight with the knot in front, or a single turn in the knot is made and constriction applied according to the need during the operation. By the other method an assistant grasps the lateral attachments of the uterus with the thumbs and fingers of both hands and makes compression of the uterine and ovarian arteries as required. The advantages of the rubber constrictor are: that it does not require an individual assistant, that it more surely prevents hemorrhage, and that it is less in the way of the operator than are the hands of an assistant. It has a distinct disadvantage in its liability to cause asphyxiation of the child; and it has a tendency to cause partial paralysis of the uterus, and so favors bleeding by preventing uterine contraction after the organ is emptied. A good assistant holding the uterus can both estimate the degree of compression required and apply it with lessened liability of fœtal asphyxiation. He can also be of service in steadying the uterus for the operator.

The uterine incision should be a clean cut, which should be made at first only large enough to admit two fingers, when the opening can then be enlarged with the fingers holding it open, and either a bistoury or blunt scissors used for making the enlargement.

Many different incisions of the uterus have been advocated, but only one—the longitudinal—can be employed with the uterus *in situ*. Following is a list of the various incisions advocated: the longitudinal middle third (Sänger); the posterior surface (Cohnstein); the transverse lower segment (Kehrer); the transverse fundal (Fritsch); the sagittal fundal (Müller-Caruso); and the longitudinal, from fundus to Bandl's ring (Bar). Originality has evidently found its limit in methods of making uterine incisions; even the cervical incision of the discarded laparo-elytrotomy is excluded from the pioneer.

Of the above methods only those of Bar, Sänger, and Fritsch need to be considered. The Sänger incision is not rightfully his, as it was performed long before his time. The choice between it and that of Bar would depend solely upon the location of the placenta, if that could be determined—which it usually cannot. There is less certainty of contraction of the lower portion of the uterus, which gives Bar's incision an advantage for securing both greater avoidance of hemorrhage and better





behavior of the wound when sutured. It is claimed for Fritsch's transverse incision that there is less hemorrhage than in the longitudinal incision because the uterine vessels pursue a transverse course; also that there is least liability of finding the placenta in this region. Neither of these views has any special foundation in fact. It might be claimed for the method that the risk of infection is lessened by having the line of incision run at right angles to the abdominal incision, whereby possible infection of the latter would be less liable to come in contact with the former. Hahn (*Centralbl. für Gynäkol.*, December 9th, 1899) gives a summary of a total of fifty-one cases of Cæsarean section performed by Fritsch's method up to date. Two died, both from circumscribed peritonitis. The summary is inconclusive so far as showing any special advantage over Bar's incision. In the absence of special indications, Bar's incision is best.

While the uterus is being incised an assistant should endeavor to keep the lips of the abdominal wound closely coaptated to the uterus to prevent the entrance of fluids into the abdominal cavity.

There are certain advantages in bringing the uterus out of the abdominal cavity before incising it, and likewise disadvantages. The advantages are: the uterus can be better handled, its contents can be kept out of the abdominal cavity, and some time can be saved. The disadvantages are: the long abdominal incision, and the greater liability to hernia and to adhesions.

The disadvantages are subject to control by perfect technique, so that the well-known surgical rule can be applied, that free incision with perfect technique appeals to first-class operators as against the opposite method. The method with the uterus brought out should always be selected when there is any suspicion of an infected uterine cavity.

The length of the incision of the abdominal wall can best be determined in each case. Before drawing the fundus out of its bed it is well to pass two long sutures through the upper wound. These can be used, after removal of the uterus from its bed, to hold the intestines back in place. When the uterus is drawn out it should be covered with warm, sterile cloths. Pads or mats of sterile gauze should be packed underneath, to protect the abdominal cavity from fluids. In cases of special sepsis, in which it is necessary to incise the uterus before ablating it in order to save the child, it is a good measure to slip a large sheet of pure rubber, properly sterilized and punctured, over the entire uterus down to the cervical portion. It will automatically keep out every drop of fluid from the cavity.

*Location of the Placenta.*—As the result of unusual opportunity and very careful observation, G. Leopold has been able to formulate a rule for determining the placental site when the uterus has been brought into view by abdominal section. There is a constant relation between the placental site and the direction of the tubes, the latter extending backward when the after-birth is on the anterior wall, and remaining laterally, or rather directed forward, when it is on the posterior wall. In some cases there is a bulging of the uterus over the site occupied by the placenta. These are means of diagnosis which come within reach when the uterus has been exposed by abdominal section, and which can therefore be utilized in Cæsarean section. If the placenta were thus indicated as being upon the anterior middle surface of the uterus, it would be well to make the incision transversely across the fundus (Fritsch's incision), or transversely across the posterior fundus (Cohnstein's).

In making the incision through the uterus the placenta must be disregarded once the incision has been started. It can either be cut through, or separated if its edge is near the wound. The wound being of sufficient size, the child is drawn out either head or foot first, whichever way proves most convenient. The placenta may then either be removed through the opening or, the cord dropped back within the womb, be extracted through the cervix.

In the treatment of the uterine wound it is only a matter of historical interest that it was formerly thought unnecessary to suture this wound. It was thought that the uterus, being a contracting compound of variously running muscular fibres, would close the wound without the assistance of any sutures; but this view has been found to be altogether wrong, and no further discussion of it is permissible. The opposite treatment, that of water-tight suturing of the wound, is now altogether employed.

To get the most absolute coaptation and impervious union of the lips of the wound, Sänger went to the extreme of advocating the dissection of a thin strip of muscle from each raw surface of the wound in order that the peritoneum could be enfolded on both sides and prompt sealing of the wound by peritoneal agglutination thereby secured. Even this time-taking and troublesome dissection has already become historical. It is found correct in aim, but entirely unnecessary, as the same degree of coaptation can be secured by enfolding superficial sutures.

It should be borne in mind that perfect closure of the uterine wound is essential to success, and the method employed should not be slighted by any one.

First, a row of deep sutures of silk should be inserted, extensive enough to include the muscle, but not the endometrium or decidua. These sutures should be placed —interruptedly—about 1.5 cm. (.65 in.) apart, and should emerge at the same distance from the edges of the wound. Between these should be inserted a similar series of sutures at half the depth of the first set. In inserting these sutures care should be taken to have the opposite surfaces meet without irregularity in spacing, lest wrinkling result and afford a pocket for infected secretion. As the uterus will sustain constant rhythmical contractions and relaxations, it is well to tie the sutures a little too tightly rather than too loosely. A slight blanching of the included tissues is evidence of proper tension by the sutures. When both layers of the deep and half-deep sutures have been tied, a superficial row which includes only the peritoneum should be introduced. These are intended to enfold the peritoneum and bury the other sutures. Fine silk should be used. These sutures include just enough peritoneum to secure a good hold, and run entirely over the deeper layers. They may be either interrupted or continuous, following the method of Lembert in suturing the intestines. The latter method is quite as effective as interrupted suturing, and has the advantage of saving time.

As in every abdominal operation, very careful cleansing of all parts by gauze sponging should be employed, the region behind the uterus receiving special attention. Hunter Robb advises drawing the omentum down behind instead of in front of the uterus in making the final toilet of the abdominal cavity, as proving less likely to cause omental adhesions and subsequent hypogastric and epigastric pains after the uterus has contracted.

In removing the placenta, it is possible, with a little care, to avoid bringing the hands in contact with the uterine wall by keeping them within the amnion, the placenta being grasped on its fœtal surface with the amnion entirely enveloping the hands.

Irrigation of the uterus after section is not usually indicated, inasmuch as this method of operating should not be performed if infection has already taken place, the Porro method being employed instead. There may be circumstances present in the operation interfering with perfect asepsis, in which case thorough douching with bichloride solution—1 to 10,000—should be employed.

In the after-treatment of the patient but little variation from ordinary management in abdominal operations is indicated. If the bowels were not properly—*i.e.*, thoroughly—emptied previous to operation (this is peculiarly liable to be the case in Cæsarean section, where so many cases are emergency operations), efforts should be made to secure thorough cleansing at once. Otherwise the second day will be best for the administration of cathartics.

The vagina should be douched after operation to remove blood accumulations, and then treated as in ordinary labors in which douching is not necessary; but care-

ful dressing of the vulva with sterile gauze and cotton pads is essential. Voluntary micturition is preferable to catheterization. There is a physiological advantage in placing the child to the breast at regular intervals, as this stimulates the uterus to healthy contraction and favors involution. The patient should not be asked, however, to feed the child from the breasts, unless she is quite able to do so without feeling the drain.

The patient should be allowed partially to sit up in bed after eight or nine days, according to the conditions. To avoid abdominal hernia, it is best not to hurry getting the patient on her feet, the fourth week being usually time enough. An abdominal bandage, or truss, should be worn for a while.

Cœlio-Hysterectomy (the Porro operation).—In 1876 a modification of the classical Cæsarean section was performed by Edward Porro, which consisted in ligation of the uterine and ovarian arteries and removal of the uterus at the cervix, the stump being brought into the abdominal wound and there fixed.

There are two methods of performing this operation: one, the original Porro method, in which the same steps as in the method just described, up to the removal of the child, are taken, after which the ovarian and uterine arteries in the broad ligaments are tied, and the uterus then cut away just above the ligature; and the other known as the Porro-Müller method, in which the abdominal incision is made sufficiently large to permit bringing the uterus out of the abdominal cavity before removing the child, when the latter, if still alive, is removed by opening the uterus; or if the child is dead, or the uterus is dangerously septic, the entire uterus is cut away without opening it.

When the Porro method—removal of the uterine contents with the uterus *in situ*—is employed, great care is necessary to prevent contact of any of the uterine fluids with the abdominal cavity, inasmuch as this operation is generally done in preference to the so-called Sänger operation because the uterus is believed to be septic. It is better, when doing the operation, to ligate the neck of the uterus more tightly than is done in the Sänger operation, as it is most desirable to avoid flowing into the abdominal cavity, while there is no need of preserving uterine tonicity.

In doing this operation there is no necessity for care in making the opening into the uterus, and it is permissible to tear the opening with the hand instead of cutting to the desired size with knife or scissors. This may save some time and lessen hemorrhage. It is also well to draw a pad of sterile gauze down behind the uterus before making the incision into it. This will best prevent the entrance of fluids into the abdominal cavity. After the uterus has been emptied it should be cut away with scissors at about one inch above the line of constriction, the tubes and ovaries being included. The vessels should then be ligated, including those in the stump. The raw surface of the stump is next seared with pure carbolic acid. The abdominal wound is then sutured down to the stump. Knitting needles, or pins six inches or more in length, are passed through the stump, including the ligature, and are protected from cutting into the abdominal wall by pads of gutta-percha or closely folded gauze. The stump is generally well dusted with iodoform and boric-acid powders, though there is a developing tendency to discard iodoform at the present time. The entire wound is then covered with sterile gauze pads and absorbent cotton. These dressings may require removal and fresh ones to be put in their place in two or three days, especially if sepsis develops in the stump.

A modification of this method of treating the stump is known as the subperitoneal method, in which, instead of bringing the stump into the abdominal wound and fixing it there, it is left *in situ*, and a layer of peritoneum from the posterior surface of the lower uterus is dissected free from the uterus before the constrictor is applied, and then closely stitched over the stump to the peritoneum in front. This method requires, in place of the constriction ligature around the neck of the uterus, the application of clamps to the vessels in the broad ligaments; then, after removal of the uterine contents, the peritoneal flaps are dissected loose. The constrictor can then be applied without involving the flaps. This method requires more time than the older one, but is preferable when feasible.

*Complete Hysterectomy.*—The removal of the entire uterus and cervix is necessary in conditions such as cancer involving the cervix. When this is done, instead of ligaturing the stump the vessels are tied in the broad ligament and the uterus dissected out complete, as in ordinary hysterectomies in gynæcological work.

Indications for Cæsarean Section.—Certain cases of pregnancy are met with in which the physician has the choice of only one method of relief—Cæsarean section.

*Tumors and Diseases.*—Tumors of the lower segment of the uterus which cannot be removed by vaginal operation, and which are of such size as to prevent dilatation of the cervix sufficient to permit passage of the fœtus, necessitate cœlio-hysterotomy. Fibroids are most frequent in this list. Ovarian tumors impacted in advance of the head, and occupying the pelvic basin to the obstruction of the fœtus; rarely a dislocated and adherent kidney; intestinal displacement; carcinomata of the cervix, rectum, sigmoid flexure, and vagina, and certain obstructive growths following old cases of appendicitis, compose most of the abnormalities necessitating Cæsarean section. Exostoses may also compel the operation. Cicatrices of the vagina may be of sufficient size to compel Cæsarean section. It is not worth while to classify some of these obstructions as "absolute" indicators of Cæsarean section, because every case offers an individual equation, and must be decided by itself.

It may be that slitting the cervix in some cases of tumor, such as myoma, will be less dangerous than Cæsarean section; or a tumor of the ovary prolapsed into the pelvis may be removed with less danger than a Cæsarean section involves. In tumors of the lower uterus the imminent danger of rupture of that organ in cervical dilatation must be given much weight. In cicatrices of the vagina it may seem feasible to cut and dilate them, but they are liable to tear much beyond safe limits in the passage of the fœtus.

In all these various indications the general rule prevails among experienced operators that a controllable operation like Cæsarean section is much safer than severe straining and mashing of tissue involved in drawing a fœtal body through an abnormally obstructed vagina. Incisions of the cervix or of vaginal cicatrices, with blind traction and distention, cannot equal aseptic, clean abdominal incisions and neat suturing of wounds even though the latter be great in extent.

*Pelvic Contraction and Large Head.*—When a pelvis is too small to allow passage of the head of the fœtus by symphysiotomy, or when craniotomy would be as difficult and dangerous as a Cæsarean section, the indications for the latter operation may be classed as absolute. But it is almost useless to define such conditions by fixed pelvic diameters. A conjugata vera of but two inches would be "absolute," but between two and one-half and three inches it is not possible to classify the indications. The only proper method of determining the dimension indications for Cæsarean section is to learn the relative proportions existing between fœtal head and pelvic calibre; and pelvic measurement is only one-half of the problem.

Contraction of the pelvic canal of sufficient degree to render craniotomy as dangerous as Cæsarean section is one of the rarest abnormalities in obstetrics. The degree of contraction which renders the operation of symphysiotomy out of the question should be determined. This method of delivery occupies a field limited to such degree of disproportion as will permit passage of the fœtal head after section of the pubic joint without necessitating a separation of the pubic bones of more than two and three-fourth inches. A greater separation of these bones involves such risk to the sacro-iliac joints and the vaginal wall and bladder as to condemn the operation. Cæsarean section should be the absolute choice in such cases.





Symphysiotomy should be performed only when the patient is in labor, and the most useful and the safest method of determining how much separation of the pubic bone would be required is direct palpation of the head and pelvic inlet with the hand in the vagina. Approximately indicating by figures the limits, we would state that a conjugata vera of three inches and a fœtal biparietal diameter of from three and one-half to four inches would not cause too great separation of the pubic joint. Wotherspoon delivered a child weighing fifteen and one-half pounds with a separation of nearly five inches; and the patient recovered, but with a torn vagina, urethral fistula, and one-half of an inch separation of the pubic bones. Such cases get beyond the control of the operator, and are not justifiable when foreseen.

The comparative mortality and morbidity of Cæsarean section, induced labor, and symphysiotomy depend, in the answer, upon many variable points. Induced premature labor is safest for the mother and most dangerous for the child in cases requiring delivery before the thirty-second week. Cæsarean section is most dangerous for the mother and safest for the child; symphysiotomy is safer for the mother than Cæsarean section, and somewhat more dangerous than induced premature delivery. It is less dangerous for the child than the latter method, and more so than is Cæsarean section.

The essential operative mortality (that per cent. of fatalities which will follow the surgical work of the best operators in cases taken at the time most favorable, and which must follow present methods of performance in these several ways of delivery) must be the foundation for selection of method.

Induced premature labor for dystocia is essentially always of the above class, as it is performed voluntarily and at the convenience of operator and patient. The mortality is about 4 per cent., but should not be more than 1 per cent. higher than pertains to spontaneous ordinary labors. Its relative safety for the mother is unquestioned.

The mortality for the child is, and always will be, very high.

Twenty-five per cent. of all babies born die within the first year. The death rate within full term for six-months time babies is nearly 90 per cent., at seven months 75 per cent., and at eight months 50 per cent. These figures are higher than those given by French writers, but they aim to include private as well as hospital cases. Induced labor at a period nearer term than eight months would not indicate Cæsarean section as an alternative operation. Efforts have been made by Prochownick and others to keep the fœtal cranial bones soft up to term by diet, and so accomplish delivery without operation. The results obtained justify further effort in this direction.

The essential mortality from symphysiotomy is about 2.5 per cent.; this in the hands of experienced operators and when the method was properly selected. Pinard gives 5 per cent. as the mortality of 160 symphysiotomies done at the Baudelocque Clinic 1892–1899, excluding 7 deaths due to outside causes. The writer has operated 13 times without a death from symphysiotomy. The general fœtal mortality is given as 14.5 per cent.

The essential mortality from the Sänger Cæsarean section can be given only by estimate. Reynolds ("Obstetrics," Vol. II., No. 1), taking the cases of Leopold, Everke, and himself in which the patients were free from sepsis and exhaustion from labor, reports 88 cases with but 2 deaths which occurred some years ago from operative sepsis. In the hands of operators in general we would expect a percentage mortality from selected cases of about 5. For the children it should scarcely exceed the results in normal labors.

The actual mortality from the Sänger operation is from 6 to 8 per cent. in the work of the leading operators. From all sources the actual mortality from Cæsarean section is from 25 to 33 per cent. to-day. From symphysiotomy it is about 10 per cent. The mortality from the Porro operation is necessarily higher than from the Sänger operation, even in the best of hands, inasmuch as the cause of its selection is often the septic condition of the uterus.

From craniotomy there should be in favorable cases no greater mortality than from forceps deliveries. The operation is seldom performed until after the forceps has been tried severely, and the patient been bruised and often infected. In view of the very low death rate of other methods, it should not be the primary selection of method in the hands of experienced and properly prepared obstetricians; but it may often be the most expedient method for the general practitioner, in whose hands most labors occur outside of hospitals.

Given a patient not in labor but requiring induced premature labor, symphysiotomy, or Cæsarean section to secure delivery of a living child, and an obstetrician of equal experience in each method and regularly engaged in doing abdominal surgery, due regard being given to both mother and child, in cases of medium contraction not permitting forceps delivery, symphysiotomy should be selected. With more marked contraction the Sänger Cæsarean section should be preferred. Cases of severe manipulation, with the child in good condition, with probable infection of the uterus present, call for symphysiotomy in preference to the Porro operation. Symphysiotomy is not affected by infection if the writer's subcutaneous method is employed; Cæsarean section is markedly affected. If the child's condition renders delivery alive very problematical, further effort with forceps and then craniotomy may be best. The *a priori* argument in cases complicated by tumors and local diseases is in favor of Cæsarean section. Induced labor is generally decided upon by the patient.

If the physician is not accustomed to abdominal surgery, he should select symphysiotomy in preference to Cæsarean section. If he is not accustomed to any surgical work, he should choose induced premature labor, or perform craniotomy, if he must deliver the patient himself.

*The Choice of Method in Cæsarean Section.*—The Porro method is not only indicated but required in all cases of suspected existing infection of the uterus. This is the situation in cases in which extensive efforts have been made by others to secure delivery by use of the forceps or by version; when the amnion has been ruptured for hours and most of the fluid drained away; when the cervix is swollen and œdematous, the vagina hot and dry, and the vulva swollen; also when tumors and pathological changes are present in the soft parts which interfere with passage of the fœtus; in rupture of the uterus at sites difficult to suture, or when it seems safer to do a hysterectomy than to suture a jagged wound at any site. It may be indicated in very exhausted conditions of the uterus with hemorrhage present or threatening. It is indicated in certain conditions of the very rare occurrence of combined intra- and extra-uterine pregnancy. It is not indicated as a means of preventing future pregnancy, unless the operator is perfectly satisfied that he can perform it with the same degree of safety that he could a Sänger section.

To a physician of comparative inexperience in abdominal operations the Sänger Cæsarean section is probably an easier and safer method than the Porro hysterectomy.

*Edward A. Ayers.*

**CAFFEINE.**—*Theine.* $C_8H_{10}N_4O_2,H_2O$. "A feeble basic, proximate principle, obtained from the dried leaves of *Thea sinensis*, Linn. (nat. ord. *Ternstræmiaceæ*), or from the dried seeds of *Coffea arabica*, Linn. (nat. ord. *Rubiaceæ*), and found also in other plants" (U. S. P.).

"An alkaloid usually obtained from the dried leaves of *Camellia Thea*, Link, or the dried seeds of *Coffea arabica* Linn." (B. P.).

It occurs in fleecy masses of long, flexible, white crystals, permanent on exposure, of a silky lustre, having a bitter taste, and without odor. Soluble in eighty parts of cold water, in two parts of boiling water, and in thirty-three parts of alcohol. It is neutral to test paper. When ignited it is consumed without residue. A notable fea-