CRITICAL REVIEW.

Rapid Mechanical Dilatation of the Cervix in Obstetrics.

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To trace back to its origin the use of mechanical dilators in obstetric practice would be a vain task. It would seem that at most periods there has been a prejudice against the use of these instruments, and very little has been written about the earlier attempts to introduce them. Scanzoni, for example, writing about 1853, dismissed the efforts of Oslander, Carus and Busch in a few lines of general and complete condemnation, and subsequent writers have followed his example in omitting serious discussion of the subject. The five fingers of the human hand were indeed the only mechanical dilators approved in obstetric circles until the use of hydrostatic dilators,—first elastic and then non-elastic,—gradually became general. With the growth of gynæcological surgery, two or three-pronged metallic instruments, like those of Sims and Ellinger, came into fairly general use for dilating the non-pregnant cervix. In midwifery, however, instruments of this type attracted but little attention until Bossi described his original three-pronged dilator in the year 1890. In the same year Tarnier introduced his *écarteur*; this was a uterine stimulator rather than an actual dilator, and has been but little used. Cases illustrating the use of Bossi's method, however, soon began to appear in the Italian and French journals. Sangregario published cases of placenta prævia in 1893; Ferri also used the method in this complication. De Paoli published 50 cases and Bossi 112 in 1896. Beck's paper appeared in 1897. Although Bossi made a communication at the Berlin Congress in 1890, his instrument attracted little or no attention outside Italy and France until Leopold visited Genoa in 1901 and saw Bossi operate with his improved four-pronged model. Leopold soon published twelve cases, lauded the instrument highly, and expressed the hope that it might soon have a place in the midwifery bag of every medical practitioner. He endorsed the five well-known claims made for the instrument—(1) it can be used even when the cervix is closed and as yet unshortened; (2) the operator is sure of obtaining sufficient dilatation to allow of the delivery of a living child; (3) this can be secured, if necessary, in a

short time—15 to 20 minutes; (4) the use of the instrument excites uterine action even in cases of inertia; (5) dilatation up to 11cm. ($4\frac{1}{3}$ inches) can be secured without unduly distending the vagina.

Leopold's papers were rapidly followed by reports of cases of eclampsia and other complications in which Bossi's method had been used. The writers for the most part were favourably impressed. Various failures and accidents were recorded, but these were generally explained away as due to inexperience, or to faults in the construction of the instrument which could easily be remedied. Thus Knapp described a large tear which appeared in the cervix in spite of slow and careful dilatation; but the patient had only reached the beginning of the eighth month, so the case teaches the lesson that the earlier the date the greater the risk of tearing. Bischoff had two tears extending into the parametrium; but he used the three-pronged instrument subsequently discarded by Bossi. Frommer introduced his eight-pronged dilator with the object of avoiding accidents due to this cause. And so on. Lederer's paper is a fair example of these reports. He describes ten cases from Prague. There were five eclamptics, one of whom died. Other indications were phthisis and uterine inertia. The instrument was also used for the induction of premature labour. Dilatation does not appear to have been carried far enough in these cases, or else too much time for contraction was allowed to elapse between stopping dilatation and accomplishing delivery, for four of the children had to be perforated, and one was born dead, while three were still-born and died after temporary resuscitation. Only two arrived "lebensfrisch" in the world. Still Lederer was favourably impressed with the possibilities of the instrument, and claimed for it three advantages over the various hydrostatic dilators in use—(1) it could be used with closed and unshortened cervix; (2) asepsis could be ensured; (3) rapidity of action. He doubted whether the tears found in the cervix were worse than those often seen after spontaneous labour, or after turning and forceps extractions through an incompletely dilated os. More favourable results were secured by Keller, who reported 15 cases from Gusserow's clinic, in Berlin. He pointed out the great difference between cases in which the cervix was partially dilated and those in which it was not taken up at all at the beginning of the operation. In the latter cases dilatation occupied twice as long, on an average, as in the former. The instrument, he agreed with Bossi, had a dynamic action, that is, its use set up uterine contractions. This is a point of importance in the subsequent discussion. Keller did not echo Leopold's wish to see a "Bossi" in

the bag of every practitioner. He thought it should only be used by those practitioners specially experienced in obstetric work, as in the hands of a beginner it might be dangerous. He considered the invention to be an important advance, especially in the treatment of eclampsia. His own fifteen cases included nine of this nature, with two deaths.

Records of more or less successful cases, with the operators' personal impressions, were beginning to be wearisome to the reader, when in 1903 Dührssen enlivened the subject with an article entitled "Is Bossi's method really to be regarded as an advance in operative midwifery?"—a question which he answered with an emphatic negative. Dührssen had known the method since 1890, but had never tried it himself. He collected from the literature of the subject all the unfortunate occurrences on record—a striking list—and concluded (1) that the instrument did not always enable the operator to secure enough dilatation for the delivery of a living child; (2) that the operator was not able to control the process; and (3) that the method was positively dangerous, some of the tears produced being followed by bleeding, and some becoming infected. The favourable results secured by Leopold and others, Dührssen thought, could have been obtained either by hydrostatic dilators or by multiple incisions of the cervix, while the less favourable cases could have been treated better by incisions or by vaginal Cæsarean section.

This onslaught provoked a vigorous reply from Bossi, who stigmatised Dührssen as illogical and unscientific in presuming to criticise a method he had never tried. His consideration of the reports at second-hand had led him to conclusions opposed to those reached by the operators themselves, who had had the advantage of personally observing clinical, anatomical and physiological details which a mere report could not give. He left Leopold and the other writers to defend their own statements, stating that for himself and his assistants at least there had been no difficulty in securing adequate dilatation; that by keeping a finger on the cervix control of the operation had always been satisfactory; that tearing and hæmorrhage had been very rare; and that infection was more easily prevented with his than with other methods. Bossi continued that it was curious that Dührssen should recommend as an alternative for mechanical dilatation the method of multiple incisions, seeing that cuts bled more freely than tears. Unlike his critic, Bossi had given the method of incision a full personal trial, and had found that the cuts, besides causing hæmorrhage, were often extended by tearing

during the extraction of the fœtus. Such tears often involved the body of the uterus and were alone sufficient to bring about fatal results. Indeed, incision of the cervix could only be justified so long as there was no other method which answered the following demands:—(a) Certain and sufficient dilatation to allow of the delivery of a living child; (b) rapidity in securing this degree of dilatation—10 minutes and upwards; (c) power of exciting uterine action accompanying dilatation. These three demands were not supplied by hydrostatic dilators, but were met by Bossi's own method, which, in addition, could easily be carried out by any practitioner even when alone. It rendered no sutures necessary and gave the operator complete control of the situation. Thus, said Bossi, cervical incisions and, even more so, vaginal Cæsarean section remained merely as historic remembrances; the time for their use was past and gone.

Dührssen retorted that it was a falsehood to state that dilatation could always be secured sufficient for the saving of mother and child, for in a number of cases the children were dead and the mothers had been seriously injured. Bardeleben and Gauss had each demonstrated two serious tears. Wirtz had failed once in placenta prævia and twice in eclampsia. One of his cases had had to be completed by Cæsarean section, and in another the mother had died after $1\frac{1}{4}$ hours of fruitless dilatation. Uhle had lost a child while delivering with forceps after tearing the cervix. Ostrcil had had a tear in his first case, one in his second and two in his fourth, and had written that one could seldom avoid seriously lacerating the cervix when using Bossi's dilator.

It is clear that Dührssen secured considerable *éclat* in this exchange of opinions by taking advantage of Bossi's habit of expressing his statements in the form known to logicians as the "universal affirmative," a form which can be given the lie by producing a single exception. Apart from this, Bossi would have divided the honours of debate fairly evenly with his opponent.

Von Bardeleben subsequently attacked the question with a professedly open mind, began his paper with a long discussion on natural and artificial dilatations of the cervix in general, and criticised Bossi's method only after testing it himself in ten cases. This writer holds that there are two factors at work in natural dilatation, namely, the outward pull of the contracting uterine muscle and the outward push of the bag of waters or the presenting part. The outward pull can dilate in some degree without any push from the presenting part (as in transverse labours, contracted pelvis, etc.). But there can be no push of the presenting part unless the

uterus is in action. Thus the first factor (the pull) can work alone, but the second (the push) cannot work in nature unless the first be also present. The second factor or push can, of course, be imitated artificially in the absence of the first, namely, uterine action. This can be done by the fingers, by elastic bags, by non-elastic bags (with traction on the stalk), or by the diverging blades of instruments of the Bossi type. In artificial dilatation the object should be to imitate as nearly as possible the physiological process; that is, in pushing apart the sides of the cervical canal a method should be chosen which will also encourage the uterus to contract and pull the cervix open at the same time.

After experimenting in ten cases, Bardeleben concluded that the value of the metallic dilator as a stimulant to uterine action is very small, much inferior, indeed, to that of the non-elastic bags of Champetier de Ribes and others.

In this matter of observation von Bardeleben directly contradicts Bossi and Leopold, who claim, as one of the main features of metallic dilators, that they cause uterine action, even in cases of inertia, at the will of the operator. The point cannot be regarded as settled, but Bardeleben concludes from it that metallic dilators, since they do not possess the "dynamic" action claimed for them are in any case either unnecessary or undesirable. When a cervix can be dilated it should be dilated by the means most closely resembling the natural process, namely by inelastic bags. When a cervix cannot be dilated it should be cut *à la* Dührssen, rather than torn open by Bossi's dilator.

Von Bardeleben has recently followed up his first condemnation of metallic dilators by a paper "on the remote results of labours aided by rapid dilatation with mechanical dilators." He discusses once more the dangers of these instruments, and passes on to consider tears of the cervix, their frequency and results, quite apart from their causation. After 20 pages of this nature, he approaches the subject of his paper by narrating the after history of the ten women he delivered by Bossi's method, as described in his previous contribution to the subject. Four of them are excluded from consideration as one of these was dilated to 4½cm. only, for placenta prævia, and three died (of phthisis, heart disease, and eclampsia respectively). *Autopsies* revealed tears of the cervix in two of these. The six women who survived were examined for "remote results" on an average five months after confinement, and their condition is briefly described. All were uni-paræ, and five appear to have been more or less injured during delivery. This paper of 36 pages defies

abstraction. The author finally repeats his opinion that the non-elastic bag is better than the metallic dilator because its use readily allows the operator to recognise an undilatable cervix, and because, after dilatation by bags, the cervix does not contract again so rapidly as after the use of metallic dilators. A cervix either will dilate or will not dilate. If it will dilate non-elastic bags are preferable for the above reasons; if it will not dilate, it is better to cut it than to tear it. Therefore metallic dilators are either unnecessary or undesirable. The author hopes that the publication of the sad experiences of his patients may check the present *furor dilatationis* (universaldilationsfähigkeit) before still more women are thereby plunged into helplessness and suffering.

In spite of the efforts of Dührssen and Bardeleben, many reliable authorities continue to find dilators of the Bossi type useful and apparently harmless when carefully used in suitable cases.

Thus Gairdner (*Journ. of Obstet. and Gynæcol. Brit. Emp.*, Vol. iv., No. 4, p. 384) reported in October, 1903, fourteen cases in which Bossi's and Frommer's instruments were used in the Glasgow Maternity Hospital. He regards the results as quite satisfactory, and makes some useful comments.

Schurmann's important paper was abstracted (*Ibid.*, Vol. iv., No. 6, p. 566) in December, 1903. He describes ten cases dilated without evil result in Orthmann's Clinic, with Preiss' instrument. This writer goes so far as to say that mechanical dilatation will do away with cervical incisions and the vaginal Cæsarean operation.

Ballantyne, writing in February, 1904 (*Ibid.*, Vol. v., No. 2, p. 136), mentions that Professor Simpson began using Bossi's dilator in the Edinburgh Maternity Hospital on November 3rd, 1902, and reported its satisfactory action to the Edinburgh Obstetrical Society on November 8th. Eight cases are fully recorded in this paper, which should be studied carefully by British readers who contemplate using the instrument. It has, in Ballantyne's opinion, sufficient merit to counterbalance its risks and to allow a margin for inevitable accidents. "It is an instrument to be worked with the head rather than with the hand." "It is an exceptional remedy for exceptional conditions."

On December 10th, 1903, Dr. H. Macnaughton-Jones (*Ibid.*, Vol. v., No. 1, p. 90) showed to the British Gynæcological Society a modification of Bossi's dilator, which he (in 1901) was the first to use in this country. He said that he had frequently and successfully used the instrument, and he believed that the lacerations which had followed its use in some hands were avoidable.

At the Glasgow Obstetrical Society on November 25th, 1903, Dr. Jardine showed various instruments, and recommended Frommer's (*Ibid.*, Vol. v., No. 1, p. 95). If it was carefully used there was very little tearing of the cervix. Dr. Munro Kerr said that when the cervix was obliterated and the os would admit the dilator easily, dilatation would be completed safely in about 25 minutes. If the cervix is not obliterated dilatation can be safely secured if care, time and patience are expended. In these cases, however, there is decided risk of severe laceration.

The use of metallic dilators at Helsingfors has recently been reported. Hahl records eleven successful cases. He considers placenta prævia a contra-indication, and prefers forceps to turning after the use of the dilator, in order to avoid gripping of the aftercoming head by the rapidly contracting cervix. This paper was abstracted in this journal in July, 1904 (Vol. vi., No. 1); also one by Heikel describing the use of Tarnier's *écarteur* in Helsingfors. This instrument was used in 40 cases without conspicuous success. It does not compete with Bossi's type, but rather with gradual hydrostatic dilators, to which it is in some ways superior.

INSTRUMENTS.

It is not necessary at this date to describe the construction of mechanical dilators, as these are figured in the advertisement pages of most medical journals. It may be noted that Bossi's original pattern had three blades, while his new model has four, which when closed equal a No. 11 Hegar's dilator in thickness. Frommer's model has eight blades, which when closed are as thick as a 13 Hegar. Kaiser's instrument also has eight blades. Schurmann and others complain that there is not room for a finger on the cervix when the blades are so numerous. Raineri devised a five-branched instrument. The model of Preiss is favoured by some as light, handy and cheap. Nowakowski applied a cover like an expanding napkin ring to protect the cervix from the prongs of the dilator, but this is condemned, as, though it spreads the pressure over the whole surface pressed on, it renders examination during dilatation impossible. Macnaughton Jones has constructed a light and handy instrument. De Seigneux, of Geneva, has devised a new dilator quite different from all of these. It was described some months ago, but only last month a paper based on the author's communication to the Geneva Medical Association appeared in this journal (Vol. vi., No. 2, p. 191).

De Seigneux holds that all previous instruments are (1) without

true pelvic curves; (2) that they are too heavy and too complicated; and (3) that the dilating surface of the blades is too small. The plane in which the points of the blades move must be parallel with the plane of the inlet of the true pelvis if the blades are to act evenly and truly upon the cervix, whose axis is approximately perpendicular to the plane of the brim. In all instruments of the Bossi type it is impossible to bring the prongs really into the pelvic axis. To this fact is due the bulk of the tears which occur, says this author. His main object was to construct a dilator with a true pelvic curve, and this has been done in a way which the author's figure shows at a glance to be much neater and more "mechanical," as a workman would say, than the devices used in instruments of the Bossi type. All who contemplate buying dilators should carefully study de Seigneux's paper. Injuries have been described by a large number of writers as being caused by the ends of the prongs of dilators digging or boring into the cervical tissue posteriorly (Gairdner—Schurmann). The cause of these injuries is obviously, as pointed out by de Seigneux, the absence of a true pelvic curve in all instruments of the Bossi type.

MANIPULATION.

Some authorities use metallic dilators without the aid of anæsthetics, the majority prefer to have the patient anæsthetised to the surgical extent, both for the relief of pain and for the relaxation of the muscles. Rissmann and others use a speculum for introducing the instrument; most writers consider this quite unnecessary. Schurmann and a few other writers advise the use of a vulsellum, but others give a warning against this, as liable to so elongate the cervix that the prongs do not pass completely through it. The difficulties met with in inserting the instrument are obviously due to the absence of a true pelvic curve in all instruments of the Bossi type. De Seigneux claims, probably with truth, that his own invention will do away with all these, as with the risk of boring and digging injuries of the cervical wall. All advise gradual dilatation, as slow as is compatible with the safety of mother and child. Gairdner allows three minutes for each centimetre of dilatation, the eye being on the clock throughout the process. Dilatation should be slower and slower as it progresses; tearing becomes more and more likely as the process nears completion. All advise frequent if not constant examination of the cervix during dilatation by a palpating finger passed between two prongs. Keller suggests that an assistant should support the weight of the instrument and hold it

in situ, the operator turning the screw with one hand while examining with the other. Thus the delicacy of his muscular sense is not impaired by the extra muscular effort of holding the instrument. It is worthy of notice that the average time recorded as occupied in dilating the cervix seems to be growing longer and longer as experience is accumulated. It is agreed that dilatation should be carried farther than the degree absolutely necessary, because the rapidly dilated cervix contracts very quickly. Many of the injuries recorded have been caused and many children lost during the extraction of the foetus through a quickly contracting cervix. The more rapid the dilatation the more rapid is the subsequent contraction. Hahl notes the desirability of delivering with forceps rather than by turning. This, of course, is merely a special application of the general custom of sound obstetricians, who always avoid head last delivery through an imperfectly dilated cervix. The breaking of the waters during dilatation would appear from the records to be a common and unavoidable occurrence. The presenting part may be driven between the prongs, and then a difficulty occurs. For the instrument cannot be withdrawn unclosed without injuring the mother, and it cannot be closed without injuring the child. De Seigneux avoids all trouble in withdrawing the instrument, for, after removing the handle, his blades can be withdrawn one by one. Before using any instrument the purchaser should verify the markings on the scale by comparing them with the space between the prongs as directly measured with a tape measure or rule. It should be remembered when checking the scale that there is a considerable difference in area between a four-inch square and a circle with a diameter of four inches. Some writers advise covering the prongs with pieces of rubber drainage tube as an additional safeguard for the cervix.

INDICATIONS.

According to Dührssen and Bardeleben there are no indications for the use of metallic dilators. Leopold, on the other hand, lays down the following:—

1. Induction of premature labour and the acceleration of labour induced by other means.

2. *Accouchement forcé*, including eclampsia, heart disease, phthisis and other disease, putrefying foetus, threatened death of the foetus, placenta prævia, anatomical stenosis of the cervix, cicatricial stenosis of the cervix.

3. Retained placenta with contracted cervix.

Between these extremes there are various intermediate opinions. As to the induction of premature labour, the instrument has been used for this purpose by Lederer and others; but up to the present time there is no indication that it will ever be much used for strictly inducing labour, as opposed to accelerating labour induced by other means.

Eclampsia, it is safe to say, has so far been far the most frequent indication for mechanical dilatation. About placenta prævia there is a pronounced difference of opinion. In many of the early cases recorded this was the indication (Sangregario—Ferri). Bardeleben, Wirtz, Hahl and others regard it as a distinct contra-indication; their grounds for this attitude are, however, empirical and personal rather than logical. Anatomical and cicatricial stenosis are the conditions in which, above all others, Dührssen's views are shared by other writers, and in which Bossi's dilator is seen at its worst. As to the retention of the placenta by contraction upon it of a portion of the uterus, those who hold that the contracting portion is the retraction ring and not the cervix will hardly approve of the introduction of a pronged instrument for the dilatation of that structure.

The majority of writers do not appear to attach much importance to the cause or reason which makes artificial dilatation desirable. Given that Bossi's instrument is admissible in any case at all, the points to consider before using it appear to be the state of the cervix and the state of the patient rather than the nature of the reason which makes dilatation desirable. The operator will only have to choose between dilatation and the use of multiple incisions in those cases in which rapidity is the main object. He will first consider the state of the patient. If delivery within a few minutes is demanded in the interest of mother or child, the next point to consider is the state of the cervix. Here the state of the tissues is the guide rather than the size of the os. If the operator judges the cervix to be softened enough to admit of complete dilatation within a few minutes he will dilate, otherwise he will incise. Neither fingers nor bags will compete with metallic dilators when extreme rapidity is required. In cases where there is less hurry there is more room for choice. It must be remembered, however, that it is perfectly easy to tear the cervix and to infect the uterus either with the fingers or with bags. Further, on account of the perishable nature of "rubber goods," very few practitioners keep hydrostatic dilators in a state ready for use. Again, dilating with the fingers is a most painful and tiring process for the operator, and fingers

cannot be sterilised so easily as metal, if at all. It would thus appear that in the fairly common cases in which some assistance in the first stage of labour would be desirable could it be given safely and easily, there will be a field for the use of metallic dilators. This, at least, is the opinion of several authorities. That it is also the opinion of a number of practitioners is shown by the fact that one single provincial instrument maker and surgeon's sundryman has sold two dozen Bossi's dilators during the last few months.

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