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VIDEO ARTICLE

Video image: Matsubara’s Nelaton and Fishing methods for easier Bakri balloon insertion and avoiding its prolapse during cesarean section

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Introduction

Various intrauterine hemostatic balloons for postpartum hemorrhage (PPH) have been developed. Among them, the Bakri balloon has been widely used for PPH after vaginal delivery and cesarean section (CS). This balloon is considered “easy to handle” and serves as a preventive treatment for PPH as “insurance,” which explains why its use has spread.

While attempting to use it in many patients, we noted that the Bakri balloon is sometimes not so easy to handle. The obstacles hindering a smooth procedure, and thus effective hemostasis, are 1) the occasional difficulties in achieving smooth insertion of the balloon, and 2) the difficulties in keeping the balloon intrauterine, such that the balloon sometimes prolapses into the vagina.

We developed several methods to overcome these problems, of which “holding the uterine cervix” (Matsubara-Takahashi [MT] holding) has already been explained in a video article of this journal. Here, we introduce two other useful procedures: the Nelaton (Matsubara) and Fishing (Matsubara) methods, both of which will enable obstetricians to handle easily the Bakri balloon during CS.

Technical note

1. Nelaton Method (Matsubara)

The Bakri balloon sometimes does not pass through the cervix (from the hysterotomy window to the vagina), especially when the internal ostium is closed; we encounter this frequently when working with patients with placenta previa, preterm delivery, or cervical-/low-uterine myoma. Due to the pliant nature of the Bakri balloon, the balloon (vaginal side) frequently shows “coil-up”, preventing its smooth insertion. To overcome this problem, we recommend employing the Nelaton catheter (transurethral drainage catheter made from natural rubber, Izumo Health, Co., Ltd., Nagano, Japan).

The Nelaton catheter is attached to the Bakri balloon’s vaginal (insufflation) portion. The Nelaton is dropped off from the hysterotomy window into the vagina, and then the Bakri balloon automatically follows the path of the Nelaton catheter. The stiffness and weight of the Nelaton catheter facilitate its independent passage through the cervix, which also facilitates the Bakri balloon insertion into the cervix. The Bakri balloon is easily placed intrauterine. Another technique involves two branches of the vaginal parts of the Balloon end, which sometimes prevent smooth insertion of the Bakri balloon. The step-by-step procedure is as follows (Videos 1, 2):

1. Remove the stopcock from the balloon (insufflation portion: vaginal end).
2. Connect the Nelaton catheter (the thicker side, base portion) to the insufflation portion.
3. To prevent loosening of this connection (between the insufflation portion and Nelaton), tie a thread around the connection for reinforcement.
4. Tie a thread around the double branch (insufflation portion + drainage portion), making a “single branch = straight”, enabling easy balloon passage.

Although approximately one minute is required to prepare this connection, the Nelaton-connection/preparation should be done before surgery (not during surgery). This is because when employment of the Bakri balloon is actually required, obstetricians encounter marked bleeding, which requires them to insert and...
position the Bakri balloon as promptly as possible. Thus, we recommend this preparation before surgery. In a trial-and-error manner, we use a 26-French Nelaton catheter. The inner diameter of the 26-French is slightly larger than the outer diameter of the insufflation portion of the Bakri balloon, creating a snug fit. If a 26-French Nelaton catheter is unavailable, a narrower Nelaton catheter or other drainage catheter may be used as alternatives. Note: 1) the catheter should not be as pliant as the Bakri vaginal-side tube, and 2) the catheter should allow for a “good fit” for the Bakri vaginal-side tube.

When the Nelaton catheter connected to the Bakri balloon is inserted from the hysterotomy window to the vagina through the cervix, an assistant should grasp the Nelaton catheter, cut the threads, connect the stopcock, and inject the liquids (e.g., distilled water, normal saline) as usual. It is our experience that even without searching for the Nelaton (i.e., the end of the Bakri), it is usually easily located around the vaginal introitus, and thus, removal of the Nelaton does not require much force. Nelaton usually passes spontaneously through the cervix, exiting the introitus driven by its own weight. The Nelaton catheter was originally used for transient drainage of urine through the urethra. It cannot be employed for patients who have a history of urethral stricture or difficulty in catheterization, as they would risk urethral damage. However, as we use it from the hysterotomy side through the cervical canal, which is obviously wider than the urethra, urethral damage due to the catheter is unlikely.

2. Fishing Method (Matsubara)\

The Bakri balloon may be unable to retain its position, even if it is placed in the appropriate intrauterine position. Occasional uterine contractions push the balloon out from the uterus to the vagina. This can occur even in the presence of atonic bleeding, for which uterine contractions are typically weak. Balloon prolapse is a common phenomenon during CS and prevents hemostasis. To overcome this problem, we developed the Fishing method,\textsuperscript{5} a very simple procedure. Imagine that the balloon is the fish: a thread is tied to the balloon as is done with a fish, and it is continuously pulled cephalad in order to hold the Bakri in an intrauterine position. The balloon tends to exit caudally, toward the vagina, while the fishing thread counteracts this force; i.e., the thread pulls the balloon cephalad.

Preparation and procedure of the Fishing method are as follows (Videos 1, 2):
1. Tie a thread to the Bakri tube only on the vaginal side of the balloon.
2. During CS, insert the Bakri balloon from the cesarean incision to the vaginal side, as usual.
3. Next, connect the Bakri tube (shaft) with a thread. Pull the thread through the hysterotomy window. During hysterotomy closure, this thread is pulled cephalad, thereby avoiding balloon prolapse. Forceps (not fingers) should be used to pull this thread in order to avoid compromising the surgical field.
4. Continue to pull the thread cephalad. Keep the balloon at an appropriate intrauterine site to prevent prolapse.
5. Return the uterus, which has been exteriorized, to the pelvic cavity, and inflate the balloon sufficiently.
6. Optional but very effective: Hold the cervix by L-shaped or round forceps to prevent prolapse (MT-holding).\textsuperscript{2,3} This completely abolishes the risk of balloon prolapse, negating the need for fishing thread.
7. Once concerns over balloon prolapse have been resolved (as described above), cut the fishing thread.
8. Close up the abdomen.
9. Remove the Bakri balloon, typically within 12–24 hours after CS. The thread will be automatically removed with the balloon. We have not encountered thread trapping due to hysterotomy closure, which would create difficulties in balloon removal.

Typically, we use 2-0 silk as fishing thread. The fishing method, which requires only that the thread is tied to the balloon shaft, can be prepared in approximately 10 seconds (during CS as required); this is far less time than is required for the Nelaton method. Alternatively, if one is unaccustomed to this method, preparing it before surgery may be recommended. While the risk of infection may increase with its employment, after cutting it at the end of the cesarean, only 5 cm of Fishing thread remains, and this is removed on the following day. Consequently, intrauterine infections have not been observed to date.

Conclusions

Many studies have demonstrated the efficacy of Bakri balloon use for PPH, and we believe that many obstetricians are already cognizant of this. We devised these two methods in a trial-and-error manner. The Nelaton catheter for the Nelaton method and the silk thread for the Fishing method could potentially induce some complications (e.g., infection, cervical damage), although we have yet to experience these. As such, while we cannot claim that these two procedures are the best, we do believe that they are simple, easy, and effective, and hope that they assist obstetricians in handling the Bakri balloon.

Acknowledgements

The procedures described herein are associated with the co-author’s name, Matsubara. The procedures were reported previously, but the present article explains them in more detail, with visual aids (see videos). The
corresponding journal and Editor-in-Chief of the journal recommended that we use the co-author’s name when referring to these two procedures, such that they are both easily distinguishable and remembered.

Conflict of interest

The authors have no conflict of interest to disclose.

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Video Legend

Video 1. Preparation for Matsubara’s Nelaton and Fishing methods.
Video 2. Executing Matsubara’s Nelaton and Fishing methods during CS.

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