

USE OF UNIDIRECTIONAL BARBED SUTURE IN GYNECOLOGIC LAPAROSCOPIC SURGERY

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SUMMARY

With the developments in technology, lots of innovations were brought into the use of medical society. Suture material including barb technology (V-Lock) is one of them and it is important for doctors who have limited experience in laparoscopic intracorporeal knot tying. In this article; the advantages and disadvantages of this useful absorbable suture material and its utilization in laparoscopic operations will be mentioned.

Key words: barb, intracorporeal knotting, laparoscopy

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JİNEKOLOJİK LAPAROSKOPİK CERRAHİDE TEK YÖNLÜBARBED SÜTUR

ÖZET

Gelişen teknolojiyle birlikte birçok yenilikler tıbbın hizmetine sunulmuştur. Barb teknolojisi içeren sutur materyali (V-Lock) bunlardan bir tanesidir ve intrakorporal düğüm atma deneyimine sahip olmayan doktorlar için önemli bir materyaldir. Makalede, absorbabl ve kullanışlı bu sutur materyalinin laparoskopik işlemlerde kullanımı, avantajları ve dezavantajlarını göz önünde bulunduracağız.

Anahtar sözcükler: barb, intrakorporal düğüm, laparoskopi

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INTRODUCTION

In laparoscopic surgery, suturing and intracorporeal knot tying require an important amount of experience. With the developments in technology, several solutions have been proposed to help reduce the stress on surgeons. Although an inseparable component of surgery, the suture materials, were developed greatly, the perfect suture is yet to be introduced. Major facilitating solutions are easy knot tying techniques, clips which could replace knot tying and suture materials that don't require knot tying.

One of these solutions, Barb technology, has

microscopic etching which allows self-anchoring without the need of knots. Unidirectional and bidirectional barbed suture options are available. V-lock is a unidirectional polyglyconate suture material armed with a loop at one end and a needle at the other end. Loop design is secured without the need of to knot tying by passing the needle through (Figure 1, 2). The monofilament, synthetic material hydrolyzes within 180 days and tissue tension is maintained for about a month. It is attached to each mm of the tissue on its own and provides a more evenly distributed tension than the conventional smooth suture along the suture line. End result is a knotless suture line.

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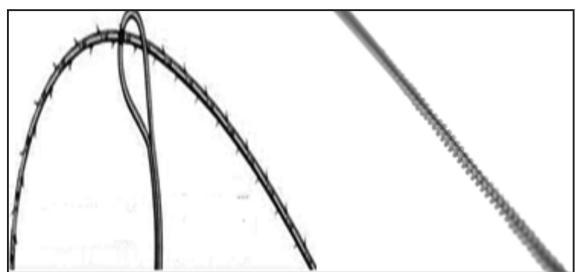


Figure 1: Barbed structure and loop design of the unidirectional barbed suture.



Figure 2: Needle passing through the loop (arrow) in closure of vaginal cuff.

Knot tying experience required for laparoscopic surgery is hard to obtain. This condition stresses the surgeon during knot tying^(1,2). In the closure of vaginal cuff, surgeons, especially the ones who have limited experience in intracorporeal knot tying prefers extracorporeal knot tying or vaginal suturing. This skill can be acquired through long and patient practice.

In a surgical procedure, a knotless suture line might seem unsecured at first. However, the conventional knot and the loss of tensile strength around the knot is not present in barbed suture⁽³⁾. Besides, a study comparing the smooth suture to barbed suture in closure of swine gastrointestinal system showed no difference between the burst strength pressures⁽⁴⁾. Barbed suture material frequently had applications such as laparoscopic closure of vaginal cuff and myomectomy procedures in gynecologic surgery. Data about Pfannenstiel incision suturing is present as well.

In gynecologic surgery, vaginal cuff dehiscence following laparoscopic vaginal cuff closure is a rare but important complication. It is necessary to acknowledge significant points to reduce the risks. First of all, bacterial contamination of the vaginal cuff causes febrile morbidity. Furthermore; this contamination might cause cellulitis of the vaginal cuff and pelvic abscess. For these reasons, suture material that will minimize the bacterial growth should be

chosen while closing the vaginal cuff. Besides, external factors the cuff might be exposed to during healing process (increase in intra abdominal pressure, sexual intercourse) should be considered. Also, thermal energy used for entering the vagina during laparoscopy causes delay in healing of the wound edges^(5,6). Therefore, in the closure of vaginal cuff, material that is more elastic and that maintains the tension force for a longer period should be preferred.

Siedhoff et al.⁽⁷⁾ retrospectively compared the bidirectional barbed sutures to other closure techniques in laparoscopic closure of the vaginal cuff following hysterectomy or trachelectomy. First year follow-up results revealed 4.2% dehiscence in other closure techniques while none was noted with barbed suture ($p=0.008$). In addition, postoperative bleeding, granulation tissue formation and cellulitis occurred more frequently in other techniques.

Mycetomy is another gynecologic procedure where barbed suture is frequently used. Due to severe blood loss that could occur during myomectomy, fast bleeding control and a secure suture line are essential. Einarson et al.⁽⁸⁾ applied barbed suture to 107 and conventional smooth suture to 31 patients following laparoscopic myomectomy. Average length of the surgical procedure has been found to be significantly shorter with barbed suture (118 vs 162 minutes, $p<0.05$). Shorter hospital stay duration was noted in barbed suture group as well (0.58 vs 0.97, $p<0.05$). However, perioperative complications, blood loss or number of myomas did not differ significantly. Alessanri et al.⁽⁹⁾ also compared the knotless barbed suture to continuous suture and intracorporeal knot tying during laparoscopic myomectomy. Barbed suture closure revealed significantly lower numbers for uterine wall closure duration (11.5 ± 4.1 vs 17.4 ± 3.8 , $p<0.001$), blood loss during the procedure ($p<0.001$) and degree of surgical difficulty ($p<0.001$). However operative time did not differ between the two groups. Einarsson et al.⁽¹⁰⁾ mentioned in another study that barbed suture material can even be utilized in single incision laparoscopic myomectomy for intramural myomas. It is noted that, since barbed suture does not require a knot, difficult steps are greatly facilitated, perfect tension is provided and advantages should be evaluated with prospective research. Studies that assess the adhesion formation in sheep myometrium at 3 months⁽¹¹⁾ showed no difference between barbed suture and polyglactin 210

(Vicryl) (52.2% vs %43.5, p>0.05).

Apart from the laparoscopic applications, barbed sutures have been utilized in closure of Pfannenstiel incisions as well. Naki et al.⁽¹²⁾ compared the barbed suture to polyglycaprone and stapler in closure of Pfannenstiel incisions performed for benign gynecological procedures. Incision length, undesired impact (dehiscence, infection, seroma, hematoma), pain and cosmetics scores were found out to be similar for three groups. Murtha et al.⁽¹³⁾ compared the barbed suture to 3-0 Polydioxanone in closure of Pfannenstiel incision and found cosmetic results and security profile to be similar to conventional method. Authors noted that risks such as the ischemia caused by tight knots, focus of infection with big knots, protrusion at wound site and needle penetrating the gloves can be avoided by using barbed sutures.

No human data is available for application of barbed suture in caesarean sections. Greenberg et al.⁽¹⁴⁾ found polyglycaprone 25 to be adequate for closure of uterus in pregnant sheep model following caesarean section and considered it as an equivalent to both chromic and polyglactine 910 absorbable sutures.

Ultimate advantage of the barbed suture is that it allows the inexperienced surgeon to complete the procedure easily and speeds up the process. From a surgical standpoint, material; given its monofilament structure, reduces the local inflammation and risk of infection⁽³⁾. Due to thornlike etching, it is attached to the each millimeter of the tissue providing both, hemostasis and an even distribution of tension across the wound. Granulation tissue formation following a vaginal cuff closure procedure with chromic catgut is an undesired outcome⁽¹⁵⁾. It might be advisable to utilize barbed suture instead of polyglactine 910 which is absorbed earlier, because of the slow healing at vaginal cuff due to thermal energy used for entering the vagina and increased risk of dehiscence⁽³⁾. Long term tissue support and decrease in granulation formation risk make barbed suture a likely candidate even in a thermal damage setting. Laparoscopic knots are relatively weaker next to robotic or manual knots⁽¹⁶⁾. Due to its thornlike structure, barbed suture resists migration by anchoring tightly.

Cuff dehiscence risk of other suture material applies to barbed suture as well. Since a knotless continuous suture line is formed after the procedure, a gentle traction should be applied to the middle of the wound

to make sure barbs are effective. As the suture cannot be withdrawn, in case a rupture occurs, a new suture should be put to use to resume. Also, presence of a long term suture material within the tissue might cause discomfort during sexual intercourse.

In our clinic, we utilized V-Lock suture material in laparoscopic hysterectomy, total laparoscopic hysterectomy (Figure 3) and laparoscopic myomectomy procedures. Suture material provided facilitation and speed, especially for myomectomy and single port operations. No vaginal cuff dehiscence was noted in follow up. Surgeons must be aware of the complications that might arise from the technological innovations. There are published cases of small bowel obstruction as an adverse effect following vaginal cuff closure with barbed suture⁽¹⁷⁾. However, it must be noted that the aforementioned problem could be the result of excess suture material measuring 4 centimeters as explained in the article⁽¹⁸⁾. Data obtained so far confirms that knotless suture material facilitates laparoscopic suturing and speeds up the procedure. Further research shall extend the applications of this practical and cost-effective material.

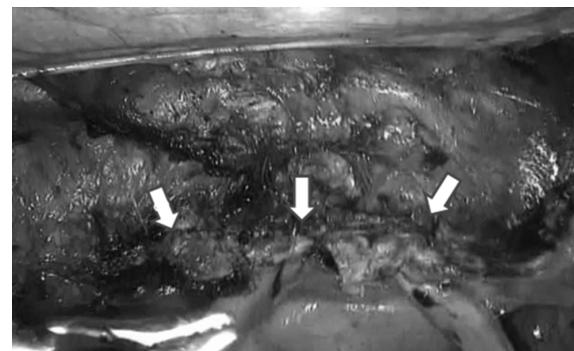


Figure 3: View of the vaginal cuff following closure with unidirectional barbed suture.

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