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UROLOGY
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GENERAL SURGERY & OTHER

Clinical evidences of the use of barbed sutures compared to conventional sutures

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The aim of this document is to present the evidence from different scientific publications comparing knotless barbed sutures (unidirectional, bidirectional) to conventional sutures (interrupted, continuous) in different surgical fields. This is not an exhaustive list of publications; reach out to your medical representative for more information.

ORTHOPEDIC SURGERY

1 | **Barbed Sutures for Total Hip and Knee Arthroplasty Have Shorter Wound Closure Time and are Cost-Effective in Comparison to Traditional Sutures:** A Systematic Review and Meta-analysis of 16 Randomized Controlled Trials. Raja B.S. et al. JOIO. 2022

2 | **Barbed suture versus traditional suture in primary Total Knee Arthroplasty:** A systematic review and meta-analysis of randomized controlled studies. Li P. et al. 2020

3 | **A comparison between barbed suture and conventional suture in Total Knee Arthroplasty:** A systematic review and meta-analysis. Li E. et al. Arthroplasty. 2020

4 | **Barbed sutures in Total Hip and Knee Arthroplasty: what is the evidence?** A meta-analysis. Borzio R.W. et al. Int Orthop. 2016

5 | **A Modified Strategy Using Barbed Sutures for Wound Closure in Total Joint Arthroplasty:** A Prospective, Randomized, Double-Blind, Self-Controlled Clinical Trial. Li R. et al. Med Sci Monit Int Med J Exp Clin Res. 2018

6 | **Is There an Advantage to Knotless Barbed Suture in Total Knee Arthroplasty Wound Closure?** A Randomized Trial in Simultaneous Bilateral TKAs. Sah A.P. Clin Orthop. 2015

7 | **Barbed Versus Standard Sutures for Closure in Total Knee Arthroplasty:** A Multicenter Prospective Randomized Trial. Gililland J.M. et al. J Arthroplasty. 2014

8 | **Barbed versus traditional sutures: closure time, cost, and wound related outcomes in Total Joint Arthroplasty.** A prospective randomized controlled trial and retrospective cohort study. Smith E.L. et al. J Arthroplasty. 2014

9 | **Use of knotless suture for closure of Total Hip and Knee Arthroplasties:** A prospective, randomized clinical trial. Ting N.T. et al. J Arthroplasty. 2012

10 | **A Prospective, Randomized Evaluation of the Quality of Wound Closure With Barbed Versus Standard Suture After Total Joint Arthroplasty** Sah A.P. Orthopedics. 2021

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ORTHOPEDIC SURGERY

1| Barbed sutures for Total Hip and Knee Arthroplasty have shorter wound closure time and are cost-effective in comparison to traditional sutures: A systematic review and meta-analysis of 16 randomized controlled trials

Author: ***Raja B.S.*** **et al.** | *Date of the publication:* ***2022***

DOI

Objective ›	**To evaluate the efficacy and superiority of bidirectional barbed sutures in comparison to traditional suturing techniques.**
Study design ›	Systematic review and meta-analysis.
Study group ›	Barbed suture (BS), Conventional suture (CS).
Endpoints ›	Wound closure time, overall cost, overall wound complications, range of motion (ROM), and KSS.
Results ›	16 RCT with 2,397 patients. BS had significantly decreased wound closure time in both THA and TKAs ($P<0.00001$) and cost ($P<0.00001$). There were no statistically significant difference in overall complications in THAs ($P=0.95$) and TKAs ($P=0.69$), in ROM ($P=0.54$) and KSS ($P=0.92$) in both the groups of patients undergoing TKA.
Conclusion ›	Barbed sutures achieve satisfactory surgical implementation being more efficient in the form of decreasing the overall wound closure time, with comparable wound complication rates and being cost-effective.

ORTHOPEDIC SURGERY

2| Barbed suture versus traditional suture in primary Total Knee Arthroplasty: A systematic review and meta-analysis of randomized controlled studies

Author: ***Li P.*** et al. | *Date of the publication:* ***2020***

DOI

Objective ›	**To provide evidence for the application of barbed suture in Total Knee Arthroplasty.**
Study design ›	A systematic review and meta-analysis of randomized controlled studies.
Study group ›	Barbed suture n=403. Traditional suture n=423
Endpoints ›	Wound closure time, wound closure total cost, complications, KSS, Knee range of motion, suture breakages, acupuncture injury.
Results ›	The results showed significantly shorter total closure time with barbed suture than traditional suture (P<.00001); significantly shorter total closure cost with barbed suture than traditional suture (P<=.0007). No significant difference was detected in complications between the two groups.
Conclusion ›	This study shows that barbed suture is a fast, low-cost, safe and effective suture method in total knee arthroplasty compared with traditional suture. In the primary total knee arthroplasty, compared with the traditional suture, the application of barbed suture not only does not increase the incidence of wound complications, but also can shorten the operation time, save the cost of surgery, and can reduce the incidence of intraoperative acupuncture injury, which is worthy of clinical physicians promotion for the use.

ORTHOPEDIC SURGERY

3| A comparison between barbed suture and conventional suture in Total Knee Arthroplasty: A systematic review and meta-analysis

Author: ***Li E.*** et al. | *Date of the publication:* ***2020*** DOI

Objective ›	**To evaluate the efficacy of barbed versus conventional sutures in Total Knee Arthroplasty (TKA).**
Study design ›	Systematic review and meta-analysis.
Study group ›	Barbed suture, Control group: Conventional suture.
Endpoints ›	Time for capsule suture, superficial and deep wound infection, wound dehiscence, suture breakage, needlestick, Hospital for Special Surgery (HSS) knee questionnaire, KSS.
Results ›	11 studies included in the analysis, n=1,546 TKA. There was a significant difference in time for capsular suture ($P<0.05$). No significant differences were identified in superficial infection and deep infection ($P>0.51$), in HSS and KSS ($P>0.05$), in suture breakage and needle stick injury ($P<0.05$), in dehiscence ($P=0.99$).
Conclusion ›	In total knee arthroplasty, both barbed and conventional sutures yielded similar results in terms of superficial and deep infection, Hospital for Special Surgery Knee Score, Knee Society Score, and wound dehiscence.

ORTHOPEDIC SURGERY

4| Barbed sutures in Total Hip and Knee Arthroplasty: What is the evidence? A meta-analysis

Author: ***Borzio R.W.*** et al. | *Date of the publication:* ***2016*** DOI

Objective ›	**To analyze the highest evidence-based studies in order to compare rates of minor and major complication, differences in operative time, and cost reduction with the use of barbed suture in Total Knee Arthroplasty (TKA) and Total Hip Arthroplasty (THA).**
Study design ›	Meta-analysis.
Study group ›	Barbed suture (Quill®), TKA n=268, THA, n=22. Control group: Conventional sutures, TKA n=279, THA n=19.
Endpoints ›	Size of incision, time savings, rate of closure, minor and major complications, real cost savings.
Results ›	4 high level evidence-based studies. The barbed suture was 6.3 minutes faster than conventional suture, ($P<0.05$). No difference in developing minor and major complications. The overall mean savings including both THA and TKA was USD 298 per case.
Conclusion ›	Barbed sutures were associated with shorter wound closure time, which corresponds to cost saving, even when the suture cost is taken into account.

ORTHOPEDIC SURGERY

5| A modified strategy using barbed sutures for wound closure in Total Joint Arthroplasty: A prospective, randomized, double-blind, self-controlled clinical trial

Author: ***Li. R.*** et al. | *Date of the publication:* ***2018*** DOI

Objective ›	**To introduce the modified method of whole layers closing and to further confirm the reliability of using barbed sutures in Total Joint Arthroplasty (TJA).**
Study design ›	RCT with simultaneous bilateral arthroplasty.
Study group ›	Barbed Suture (Quill®), n=84, Control group: Conventional suture, n=84.
Endpoints ›	Suture time, wound complications, cost-effectiveness, ROM.
Results ›	Closure time was shorter with the barbed sutures (P<0.0001). There was no difference in the complication rate for the 2 groups.
Conclusion ›	Barbed suturing was a fast and safe method for wound closure in TJA.

ORTHOPEDIC SURGERY

6| Is there an advantage to knotless barbed suture in Total Knee Arthroplasty wound closure? A randomized trial in simultaneous bilateral TKAs

Author: ***Sah A.P.*** | *Date of the publication:* ***2015*** DOI

Objective ›	**To compare wound closure performed with bidirectional barbed sutures in one knee of bilateral Total Knee Arthroplasties (TKAs) performed under the same anesthetic with those performed with standard sutures in the other knee.**
Study design ›	Randomized control trial.
Study group ›	Bidirectional barbed suture (Quill®), n=50. Control group: conventional suture, n=50.
Endpoints ›	Closure times, intra-operative suture issues (needle sticks, suture breakage), post-operative wound complications, KSS, total operative cost.
Results ›	Mean wound closure time was 4.7 minutes less using barbed sutures (P<0.001). There were no needle disengagements or suture breakages with barbed-suture closure. There were no postoperative wound dehiscences or disruptions of the arthrotomy closure with either closure technique. No difference in 1-year KSS. There was a cost saving of mean USD 175 per case when using barbed suture.
Conclusion ›	Knotless bidirectional barbed suture was more efficient in terms of closure time and lower in direct operative cost than conventional suture material, while showing no difference in terms of Knee Society scores, or wound appearance with the numbers available.

ORTHOPEDIC SURGERY

7| Barbed versus standard sutures for closure in Total Knee Arthroplasty: A multicenter prospective randomized trial

Author: ***Gililland J.M.*** et al. | *Date of the publication:* ***2014*** DOI

Objective ›	**To determine the efficiency and safety of barbed suture in TKA.**
Study design ›	Multicenter randomized control trial.
Study group ›	Barbed suture (Quill®), n=191. Control group: Knotted interrupted suture, n=203.
Endpoints ›	Total closure time, closure rate (sec/cm), final cost, overall complications.
Results ›	Closure time was shorter with barbed suture (P<0.001). Total closure cost was less with barbed suture (USD 324 vs. USD 419, P<0.001). Early complications and outcomes were similar between groups.
Conclusion ›	The use of barbed suture in TKA is associated with shorter closure time, lower cost and similar outcomes and complications when compared with standard sutures.

ORTHOPEDIC SURGERY

8| Barbed versus traditional sutures: Closure time, cost, and wound related outcomes in Total Joint Arthroplasty

Author: ***Smith E.L.*** et al. | *Date of the publication:* ***2014*** DOI

Objective ›	**To prospectively investigate barbed sutures by comparing them to conventional sutures when used to close primary TKA and primary THA.**
Study design ›	Randomised Control Trial (RCT).
Study group ›	Barbed suture (Quill®), n=18. Control group: Conventional suture, n=16.
Endpoints ›	Time to wound closure, cost and rates of wound complications.
Results ›	Barbed sutures decreased time to wound closure by 9.72 min ($P<0.05$). The analysis reveals an average savings of USD 549.59 per arthroplasty when using Quill® sutures.
Conclusion ›	Barbed sutures are associated with a decreased time to wound closure following TKAs and THAs and the financial benefit associated with saving time in the operating room is significant.

ORTHOPEDIC SURGERY

9| Use of knotless suture for closure of Total Hip and Knee Arthroplasties: A prospective, randomized clinical trial

Author: ***Ting N.T.*** et al. | *Date of the publication:* ***2012***

DOI

Objective ›	**To evaluate the efficacy of using a bidirectional barbed suture compared with traditional sutures in the deep closure of THA and TKA.**
Study design ›	Randomised control trial.
Study group ›	Barbed suture (Quill®), n=31. Control group: Conventional suture, n=29.
Endpoints ›	Wound closure time, complication rate, incision length, cosmesis, cost.
Results ›	Closure was noted to be significantly faster ($P<0.005$) in the barbed suture group. Wound-related complications were similar (3 cases) in both groups at 3-month follow-up.
Conclusion ›	Barbed closures were faster, required fewer individual sutures and did not alter the ultimate skin closure and healing process.

ORTHOPEDIC SURGERY

10| A Prospective, Randomized Evaluation of the Quality of Wound Closure With Barbed Versus Standard Suture After Total Joint Arthroplasty

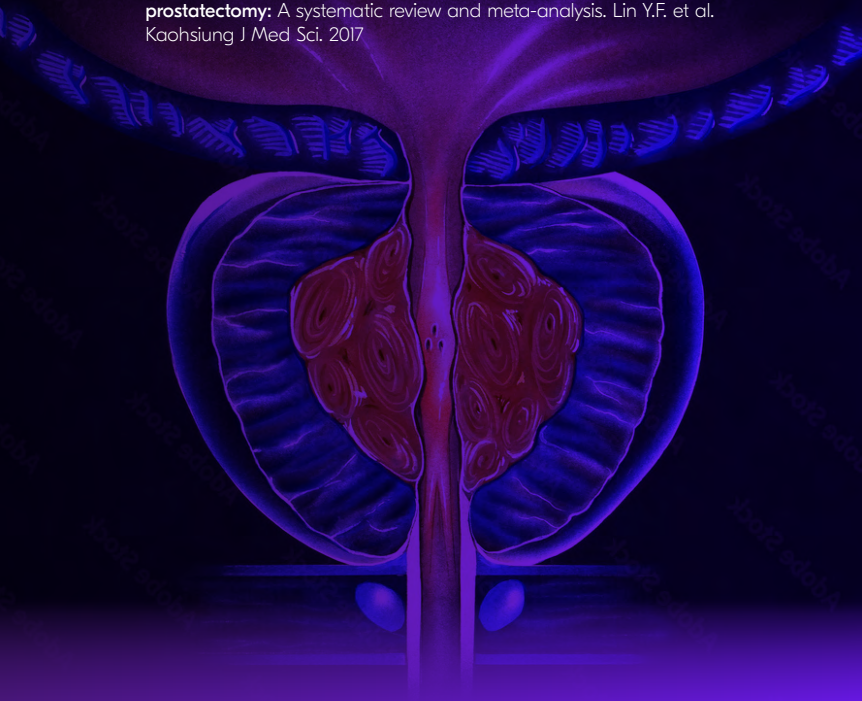
Author: ***Sah A.P.*** | *Date of the publication:* ***2021***

DOI

Objective ›	**To compare the quality of running knotless barbed suture vs. standard monofilament suture wound closure with respect to wound drainage and healing complications after Total Joint Arthroplasty.**
Study design ›	A prospective, randomized evaluation.
Study group ›	Barbed suture (BS) (Quill®, unidirectional and bidirectional), n=348. Control group: conventional suture (CS), n=326.
Endpoints ›	Closure times, Intraoperative suture issues, Knee range of motion, Harris Hip Score, Knee Society Score, Total operative cost, Wound drainage.
Results ›	There was no difference between the groups in terms of suture failure ($p=0.17$). Time to closure was significantly shorter in the BS group ($p<0.0001$). There were fewer minor wound complications in the BS group ($p<0.025$). The total weight of wound drainage fluid was lower in the BS group than in the CS group ($p=0.002$).
Conclusion ›	This study does represent a relatively large group of patients, and the comparisons indicate possible benefits of barbed suture in joint arthroplasty wound closure.

UROLOGY

11 | **Efficacy and safety of barbed suture in minimally invasive radical prostatectomy:** A systematic review and meta-analysis. Lin Y.F. et al. Kaohsiung J Med Sci. 2017



UROLOGY

11| Efficacy and safety of barbed suture in Minimally Invasive Radical Prostatectomy: A systematic review and meta-analysis

Author: ***Lin Y.F.*** **et al.** | *Date of the publication:* ***2017***

DOI

Objective ›	**To obtain more validated results on the application of knotless barbed sutures in Minimally Invasive Radical Prostatectomy (MIRP) in comparison with the conventional sutures.**
Study design ›	Systematic review and meta-analysis.
Study group ›	Barbed suture, n=457. Control group: Conventional suture, n=452.
Endpoints ›	Operative time, suturing time, estimated blood loss or change in hemoglobin level, length of catheterization, hospital stay, postoperative complications, continence rate.
Results ›	Pooling data of cohort studies showed that suture time ($P<0.0001$) and length of hospital stay ($P=0.03$), were significantly shorter in the barbed group. Subgroup analysis by type of MIRP suggested that patients who underwent barbed suture during robot-assisted surgeries had a shorter hospital stay ($P<0.001$). During the laparoscopic surgery, patients in the barbed suture group had fewer postoperative complications ($P<0.05$).
Conclusion ›	Significant decline of suture time, operative stay, and hospital stay were found using barbed suture during MIRP. Laparoscopic Radical Prostatectomy (LRP) seemed to be safer in the application of the barbed suture.

OBSTETRICS & GYNECOLOGY

12 | **Knotless Barbed versus Conventional Suture for Closure of the Uterine Incision at Cesarean Delivery:** A Systematic Review and Meta-analysis. Raischer H.B. et al. J Minim Invasive Gynecol. 2022

13 | **The Role of Knotless Barbed Suture in Gynecologic Surgery:** Systematic Review and Meta-Analysis. Lavazzo C. et al. Surg Innov. 2015

14 | **Barbed Suture in Minimally Invasive Hysterectomy:** A systematic review and meta-analysis. Bogliolo S. et al. Arch Gynecol Obstet. 2015

15 | **Dramatically Reduced Incidence of Vaginal Cuff Dehiscence in Gynecologic Patients Undergoing Endoscopic Closure with Barbed Sutures:** A retrospective cohort study. Rettenmaier M.A. et al. International Journal of Surgery. 2015

16 | **Bidirectional Barbed Suture in Laparoscopic Myomectomy:** Clinical features. Ardovino M. et al. J Laparoendosc Adv Surg Tech A. 2013

OBSTETRICS & GYNECOLOGY

12| Knotless barbed versus conventional suture for closure of the uterine incision at cesarean delivery: A systematic review and meta-analysis

Author: ***Raischer H.B.*** et al. | *Date of the publication:* ***2022*** DOI

Objective ›	**To compare perioperative outcomes between knotless barbed sutures and conventional smooth sutures for uterine incision closure at cesarean section.**
Study design ›	Systematic review and meta-analysis.
Study group ›	Knotless barbed sutures (KBSs), n=1,473, Control group: Conventional smooth sutures, n=1,859.
Endpoints ›	Time of uterine incision closure (seconds), total operating time (minutes), use of additional hemostatic sutures, rates of blood transfusion and postoperative complications.
Results ›	4 eligible studies at low risk of bias, included 3,332 patients. The uterine incision closure time was significantly lower in the KBS group (P=0.001). Furthermore, the rate of use of additional hemostatic sutures was significantly lower in the KBS group (P=0.001). The incidence of postoperative ileus was significantly lower in the KBS group (P=0.029). Total operative time, rates of blood transfusion, febrile morbidity, and length of postoperative stay were comparable.
Conclusion ›	The use of KBSs for uterine incision closure was associated with decreased hysterotomy closure time and less frequent need for the placement of additional hemostatic sutures. Other perioperative outcomes were not affected, although the risk of postoperative ileus was reduced.

OBSTETRICS & GYNECOLOGY

13| The role of knotless barbed suture in Gynecologic Surgery: Systematic review and meta-analysis

Author: ***Lavazzo C.*** **et al.** | *Date of the publication:* ***2015*** DOI

Objective ›	**To present the available evidence concerning the use of knotless barbed sutures in gynecologic surgery.**
Study design ›	Systematic review and meta-analysis.
Study group ›	Barbed sutures, n=1,012, (Vaginal Cuff Closure (VCD), n=767; myometrial closure n=245). Control group: Conventional sutures, n=979.
Endpoints ›	Operative time, estimated blood loss, Vaginal Cuff Dehiscence (VCD).
Results ›	The duration of closure with barbed suture ranged from 3.9 to 13 minutes, which was less than the use of conventional suture in every study. The duration of suturing was significantly less in the barbed suture group during hysterectomy, the mean difference between the groups was 2.41 minutes per operation. The estimated blood loss in myomectomy was found to be statistically significant (P=0.04). VCD was found to not be statistically significant.
Conclusion ›	The main advantages of barbed sutures are the complete absence of knots, the even distribution of tissue strength along the wound and the reduction of operation time.

OBSTETRICS & GYNECOLOGY

14| Barbed suture in minimally invasive hysterectomy: A systematic review and meta-analysis

Author: ***Bogliolo S.*** et al. | *Date of the publication:* ***2015*** DOI

Objective ›	**To analyse the role of barbed suture in minimally invasive hysterectomy, evaluating the benefits in terms of reducing operative time, blood loss, and surgical dehiscence of Vaginal Cuff.**
Study design ›	Systematic review and meta-analysis.
Study group ›	Barbed suture, n=673 (Quill®, n=328; V-Loc, n=345). Control group: Conventional suture, n=996.
Endpoints ›	Vaginal Cuff suturing time, Vaginal Bleeding, VCD with or without small bowel evisceration.
Results ›	Vaginal Cuff suturing time was significantly reduced with the use of barbed suture (P<0.001).
Conclusion ›	Barbed suture is safe and well tolerated as traditional sutures and is associated with reduced operative time of Laparoscopic Vaginal vault closure.

OBSTETRICS & GYNECOLOGY

15| Dramatically reduced incidence of Vaginal Cuff Dehiscence in gynecologic patients undergoing endoscopic closure with barbed sutures: A retrospective cohort study

Author: ***Rettenmaier M.A.*** et al. | *Date of the publication:* ***2015*** DOI

Objective ›	**To document the rate of VCD in a large series of gynecologic patients who were treated with an endoscopic hysterectomy that incorporated either delayed absorbable monofilament barbed or vicryl running sutures.**
Study design ›	Retrospective cohort study.
Study group ›	Barbed suture (V-Loc, Quill®), n=456 Control group: Conventional suture (Vicryl), n=1,421.
Endpoints ›	Incidence of a VCD, endoscopic surgical approach, energy source, closure method, number of vaginal deliveries, time to VCD development, initiation of antecedent intercourse and follow-up duration.
Results ›	Subsequent regression analysis revealed that only the use of vicryl sutures was a surrogate marker for the manifestation of VSD (P=0.034). The type of endoscopic surgery and energy source were not significant prognostic factors.
Conclusion ›	While the incidence of VCD in this study was low and comparable to other reported rates in the literature, the authors did not observe any cases of VCD following Laparoscopic Hysterectomy performed with barbed suture closure.

OBSTETRICS & GYNECOLOGY

16| Bidirectional barbed suture in Laparoscopic Myomectomy: Clinical features

Author: ***Ardovino M.*** *et al.* | *Date of the publication:* ***2013*** DOI

Objective ›	**To compare bidirectional knotless barbed suture versus standard sutures, with either extracorporeal or intracorporeal knots, and to assess the feasibility, safety, and rapidity in repairing a uterine wall defect after laparoscopic myomectomy.**
Study design ›	Randomized clinical trial.
Study group ›	Group A, n=44, underwent suture of the uterine wall defects with extracorporeal knots using poliglecaprone 25, Group B, n=37, underwent suture with intracorporeal knots using polyglactin acid 910. Group C, n=36, in layers closure using a 14x14-cm #0 bidirectional knotless barbed suture (Quill®).
Endpoints ›	Operative and suture time, intraoperative blood loss, degree of surgical difficulty, assessment of feasibility, safety and rapidity in repairing a uterine wall.
Results ›	Time required to suture was significantly lower in the group operated on with a bidirectional suture than in groups with traditional sutures (P<.001). No significant difference was observed in operative time among the study groups. The degree of surgical difficulty was significantly lower in the Quill® group than in the other groups (P<0.01).
Conclusion ›	Use of barbed sutures reduces the time required to repair a uterine wall defect during laparoscopic myomectomy.

GENERAL SURGERY & OTHERS

17 | **The Efficacy and Safety of Knotless Barbed Sutures in the Surgical Field:** A Systematic Review and Meta-analysis of Randomized Controlled Trials. Lin Y. et al. Sci Rep. 2016

18 | **Long-term follow-up after Surgical Repair of Abdominal Rectus Diastasis:** A Prospective Randomized Study. Swedenhammar E. et al. Scand J Surg SJS Off Organ Finn Surg Soc Scand Surg Soc. 2021

VARIOUS SURGICAL FIELDS

17| The efficacy and safety of knotless barbed sutures in the surgical field: A systematic review and meta-analysis of randomized controlled trials

Author: ***Lin Y.*** et al. | *Date of the publication:* ***2016*** DOI

Objective ›	**To present the available evidence in terms of the efficacy and safety of different types of knotless barbed sutures in different surgeries.**
Study design ›	Systematic review and meta-analysis
Study group ›	Barbed suture, n=994 (unidirectional, n=428; bidirectional, n=566). Control group: Conventional suture, n=998.
Endpoints ›	Suture time, operative time, post-operative complications.
Results ›	17 RCT in different surgical fields. Compared with conventional sutures, the barbed suture could significantly reduce suture time (P=0.0001) and the operative time (P=0.003). Although barbed sutures resulted in more postoperative complications, no significant change occurred concerning the estimated blood loss. The pooled results of a bidirectional barbed suture did not statistically differ from the control in all outcomes.
Conclusion ›	A significantly decreased suture time and operative time was found in the unidirectional barbed suture groups. The bidirectional barbed suture appeared safer than the unidirectional sutures.

GENERAL

18| Long-term follow-up after surgical repair of abdominal rectus diastasis: A prospective randomized study

Author: ***Swedenhammar E.*** et al. | *Date of the publication:* ***2021***

DOI

Objective ›	**To compare long-term outcomes of Abdominal Rectus Diastasis (ARD) repair using double-row Quill® self-retaining suture with retromuscular mesh repair in patients with functional disability due to ARD.**
Study design ›	Prospective randomized trial.
Study group ›	Barbed suture (Quill®), n=29. Control group: Polypropylene mesh (BARD™ Soft Mesh), n=28.
Endpoints ›	Recurrence rate of diastasis after the 1-year follow-up, QoL, self-reported abdominal muscle strength, pain in the abdominal wall.
Results ›	No recurrence of abdominal rectus diastasis appeared. “Pain this week” decreased significantly at long-term follow-up compared to prior to surgery (mesh P=0.009, Quill® P=0.003). There was no difference in quality of life or long-term pain between the two surgical groups.
Conclusion ›	Implantation of retromuscular mesh entails more extensive surgery implying potentially higher risk for complications. This leads to recommend reconstruction with double-row self-retaining sutures for the repair of abdominal rectus diastasis in patients with functional disability.

Abbreviations:

ARD: Abdominal Rectus Diastasis
KBS: Knotted Barbed suture
KSS: Knee Society scores
LRP: Laparoscopic Radical Prostatectomy
MIRP: Minimally Invasive Radical Prostatectomy
ROM: Range Of Motion
THA: Total Hip Arthroplasty
TJA: Total Joint Arthroplasty
TKA: Total Knee Arthroplasty
VCD: Vaginal Cuff Dehiscence

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