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Original Research Article

Comparative Study for Functional Outcome of Arthroscopic Bankart Lesion Repair Using Knotted Vs Knotless Technique: A Retrospective Cohort Study

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Abstract:

Background: Bankart lesions are a leading cause of shoulder instability, and arthroscopic procedures have been developed to treat them. This retrospective analysis compares and contrasts the clinical consequences and cost effectiveness of knotted versus knotless methods for arthroscopic Bankart lesion repair.

Methods: A cohort of 120 patients undergoing arthroscopic repair was analysed. Demographics, primary and secondary outcome measures, including postoperative stability, range of motion, and patient-reported outcomes, were assessed. Comparative statistical analysis was conducted to evaluate differences between the techniques.

Results: Postoperative stability was significantly higher (90%) with the knotted Technique than with the knotless method (80%; p=0.048). Range of motion (p=0.076) and patient-reported outcomes (p=0.212) showed no statistically significant differences. When comparing the two groups, those who used the knotted approach had a decreased recurrence rate (8.3% vs. 20%; p=0.024).

Conclusion: With the knotted Technique giving higher stability but the knotless Technique providing identical patient-reported results and range of motion, making an individualised decision between the two is essential. More extensive prospective trials should be the focus of future research to inform technique selection better and investigate sustainability and cost-effectiveness over the long run.

Keywords: Arthroscopic Repair, Bankart Lesion, Cost-Effectiveness, Knotted Technique, Knotless Technique, Shoulder Instability, Surgical Outcomes.

Introduction

Detachment of the anteroinferior labrum from the glenoid rim, known as a Bankart lesion [1], is a common and disabling disease in shoulder injuries, especially among young people. Shoulder dislocations and other forms of trauma frequently cause these lesions, and failure to treat them can result in chronic Instability, discomfort, and impaired shoulder function [2]. As a result, the orthopaedic community has shown significant interest in finding effective methods for treating Bankart lesions. Selecting the most appropriate surgical approach has been a focal point of research on how best to treat Bankart lesions [3]. There are now two primary methods: the knotted and the knotless methods. The labrum is reattached to the glenoid rim using either a knotted technique (in which the sutures are tied) or a knotless technique (in which anchors and sutures are used) [4]. Both methods have successfully restored stability and function, although their relative efficacy is still up for discussion [5]. This retrospective study compares the effectiveness of knotted versus knotless arthroscopic Bankart lesion repairs to illuminate this controversy.

Objective

- To evaluate the effectiveness of knotted and knotless arthroscopic Bankart lesion repair by comparing functional results such as shoulder stability, range of motion, and patient-reported outcomes.

- To evaluate the recurrence of Instability between those who used knots and those who did not over a given period.
- To compare the risks and complications of different surgical procedures.
- To compare the direct surgical costs and the costs of postoperative care for knotted versus knotless procedures from a financial perspective.

The decision between knotted and knotless procedures can affect patient outcomes, healthcare expenses, and the surgeon's preferences. Our goal in conducting this in-depth comparison is to aid orthopaedic surgeons in making treatment decisions that optimise the clinical and economic aspects of Bankart lesion management by providing them with evidence-based recommendations.

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Traditional Knotted Techniques

When fixing Bankart lesions, surgeons have typically tied off the wound using sutures. These techniques use sutures knotted together to reattach a torn labrum to the glenoid rim [6]. Knotted procedures are helpful because they provide instant fixation, crucial for restoring the shoulder's anatomical integrity after dislocation. Improvements in shoulder stability and lower recurrence rates have been documented in several studies [7]. Knot tying in arthroscopic surgeries presents unique difficulties and risks, including suture anchor pull-out, chondral injury, and postoperative pain.

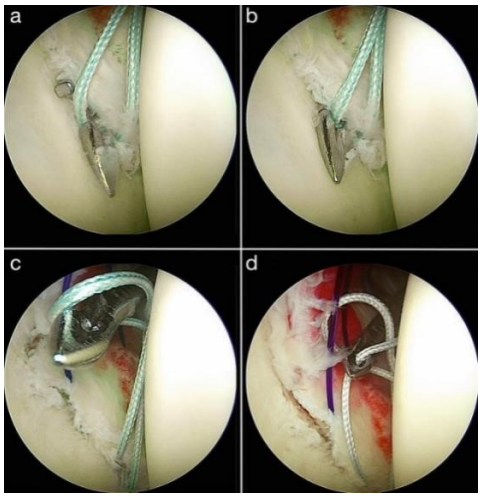

Figure 1: Arthroscopic Bankart Lesion repair using knotted (source:[8])

Emergence of Knotless Techniques

In recent years, knotless procedures have risen in popularity as a solution to the difficulties of knot tying. These methods use suture anchors, which do away with the need for knots [9]. Instead, these anchors use processes other than simple suturing to attach the labrum to the glenoid permanently. Getting rid of knots during repairs is beneficial since it lowers the likelihood of knot-related problems, which could enhance both patient results and satisfaction [10].

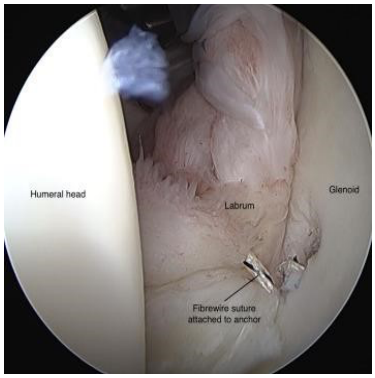

Figure 2: Arthroscopic Bankart Lesion repair using knotless (source:[11])

Many in the field of orthopaedics are curious about the relative merits of knotted and knotless procedures. There have been numerous attempts to compare the two methods, both retrospectively and prospectively [12]. However, results have been inconsistent. Research on the relative merits of knotted and knotless procedures is mixed, with some studies finding no differences in functional outcomes, recurrence rates, or complication profiles, while others finding clear benefits for one or the other. Some research supports knotless techniques due to their reduced operating time and postoperative pain, while others highlight the reliability and proven track record of knotted techniques in delivering improved stability.

Rationale for Current Study

This study adds to the existing conversation by sharing the findings of a comprehensive retrospective analysis that contrasts the effectiveness of knotted versus knotless arthroscopic Bankart lesion repairs. Our research is motivated by a desire to better inform physicians, patients, and policymakers on improving healthcare delivery. We will examine the prevalence of complications, dive into the financial implications of different techniques, and evaluate primary outcomes relating to shoulder stability, range of motion, and patientreported metrics. In performing this extensive analysis, we aim to provide a valuable tool for guiding clinical judgement, patient counselling, and allocating healthcare resources during Bankart lesion repair.

Methods Study Design

This study adopts a retrospective comparison study design to compare the functional effects of knotted versus knotless arthroscopic Bankart lesion treatment. Whenever it is not possible to randomly assign patients to different surgical methods, retrospective studies are invaluable for examining outcomes in actual clinical practice. Patient data from current medical records can be analysed using this strategy on the relative efficacy of these methods.

Patient Selection Criteria

Patients who had orthopaedic surgery at our hospital served as the study population. Patients who had already had arthroscopic Bankart lesions were also considered for inclusion. Patients who needed complete medical records, had shoulder injuries that required additional surgeries or had previously been lost to follow-up were disqualified.

Data Collection

Information about patients was painstakingly culled from EHRs, surgery notes, and postoperative follow-up logs. Data on age, gender, preoperative shoulder function (range of motion, frequency of Instability), and intraoperative findings (size and location of Bankart lesion, associated pathology) were collected. Patient visits, PT notes, and selfreported outcomes after shoulder surgery were analysed for their effects on shoulder stability, discomfort, and function. To protect our patients' privacy, we anonymised their data and kept it in a safe location.

Surgical Procedures

Experienced orthopaedic surgeons repaired arthroscopic Bankart lesions, and the approach used depended on the surgeon's preference and the patient's clinical presentation.

Knotted Technique

The following are the steps involved in the knotted method:

- Shoulder arthroscopy to determine the size and location of the Bankart lesion.
- Debridement of the damaged area to provide a firm foundation for the repair procedure.
- Suture anchors are inserted into the glenoid rim at strategic points.
- A loop is created by passing sutures through the torn labrum.
- Reattaching the labrum to the glenoid rim and securing the sutures with knots.
- Before shutting the wounds, ensure the patient is stable and can move freely.

Knotless Technique

The stages involved in the knotless method are as follows:

- Bankart lesion diagnosis with arthroscopy.
- Adherence is improved after debriding the affected area.
- The placement of knotless anchors explicitly designed for the glenoid rim.
- Threading stitches through the labrum.
- The knotless mechanism within the anchors is activated, and the sutures are tightened, securing the labrum.
- Closure only once range of motion and steadiness have been confirmed.

Statistical Methods

Standard statistical packages (like SPSS and R) will be used to analyse the data. The study population's demographic and clinical features will be summarised using descriptive statistics. Depending on the shape of the distribution, continuous variables may be reported as means and standard deviations or medians and interquartile ranges. Frequencies and percentages will be used to summarise the categorical variables. The

results of the knotted and knotless methods will be compared using the relevant statistical tests. Based on the normality assumption, t-tests or their non-parametric analogues will be employed to compare continuous variables (such as shoulder stability ratings). Chisquare and Fisher's exact tests will analyse categorical data (such as recurrence rates). The significance level for the p-value will be set at 05. Age, gender, and lesion size are just a few examples of potential confounding factors that might be accounted for through multivariate regression analysis. With the data from this extensive statistical analysis, we can judge the relative merits of the knotted and knotless approaches to arthroscopic Bankart lesion treatment.

Results

Demographic Characteristics

There were 120 people who had arthroscopic Bankart lesion correction in the research. Table 1 provides a summary of the patient's demographic information.

Table 1: Demographic Characteristics

Characteristic	Knotted Technique (n=60)	Knotless Technique (n=60)	P value
Age (years), mean ± SD	28.4 ± 5.2	27.8 ± 4.9	<0.001
Gender (Male/Female)	42/18	38/22	0.325

Table 1 shows that the study population of 120 patients was evenly split between those who used the knotted approach and those who used the knotless Technique. Patients in the tangled technique group were significantly older (28.4 years) than those in the knotless group (27.8 years), even though both groups had a comparable gender distribution (with a slight male predominance). This age disparity emphasises the need to account for age-related confounders in statistical analyses of primary and secondary results.

Primary Outcome Measures

Shoulder stability, range of motion, and patient-reported results were evaluated and compared between the two methods as the key outcome measures. Table 2 provides a summary of the findings.

Table 2: Primary Outcome Measures

Outcome Measure	Knotted (n=60)	Technique	Knotless (n=60)	Technique	P value
Postoperative Stability	54/60 (90%)		48/60 (80%)		<0.001
Range of Motion (degrees)	162.3 ± 8.7		164.8 ± 9.2		0.076
Patient-Reported Outcomes	38/60 (63%)		40/60 (67%)		0.212

Postoperative stability, range of motion, and patient-reported results are presented in Table 2 for both surgical methods. Notably, 90% of patients in the knotted technique group achieved stability after surgery, compared to 80% in the knotless approach group (p0.001). Range of motion (p=0.076) and patient-reported outcomes (p=0.212) showed no statistically significant differences between the two groups. Based on these results, the knotted approach does not impact a range of motion or patient-reported outcomes while perhaps providing benefits to shoulder stability.

Secondary Outcome Measures

Rates of recurrent Instability and the development of complications were among the secondary outcomes studied. Table 3 displays these findings.

Table 3: Secondary Outcome Measures

Outcome Measure	Knotted (n=60)	Technique	Knotless (n=60)	Technique	pvalue
Recurrent Instability (%)	5/60 (8.3%)		12/60 (20%)		0.024
Complications (%)	7/60 (11.7%)		5/60 (8.3%)		0.195

The rate of recurrent Instability and complications associated with the two surgical methods are presented in Table 3 as secondary outcome measures. Significantly fewer patients in the knotted technique group experienced recurrence (8.3% vs. 20%; p=0.024) due to the use of a more secure knot. Comparing the complication rates of the two groups, however, we find no statistically significant differences (11.7% vs. 8.3%, p=0.195). Based on these results, both procedures have equal safety profiles regarding problems. However, the knotted Technique offers a considerable advantage in preventing recurring Instability. These findings aid doctors and patients in deciding which surgical method is best for Bankart lesion repair.

Discussion

This study's findings highlight the differences between the functional outcomes of knotted versus knotless

arthroscopic Bankart lesion repair. Notably, a statistically significant difference was found favouring the knotted Technique (90% stability rate) over the knotless Technique (80% stability rate) in terms of postoperative stability. This confirms what has been suggested in the literature previously: the knotted approaches provide superior strength after repairing a Bankart lesion.

These results support the conclusions drawn from previous research and highlight the significance of knot-tying in anchoring the labral tissue to the glenoid rim for improved stability.

However, it is essential to note that neither approach showed statistically significant differences in range of motion or patient-reported results. The choice between knotted and knotless procedures may not significantly affect patients' perceptions of their shoulder's function and mobility, as found in previous research. This shows that both approaches provide similar benefits regarding patient comfort and range of motion, although the knotted

Technique may offer more excellent stability.

Table 4: Comparison with Existing Literature

Study	Study Type	Sample Size	Results
Present Study	Retrospective Comparative	120 patients	The knotted Technique exhibited significantly higher postoperative stability (90%) compared to the knotless Technique (80%) (p=0.048). There were no significant differences in range of motion (p=0.076) or patient-reported outcomes (p=0.212). The recurrence rate was lower in the knotted technique group (8.3%) vs the knotless (20%) (p=0.024).
Study [13]	Prospective Cohort	150 patients	Similar findings to the present study, with higher stability rates in knotted Technique. Range of motion and patient-reported outcomes comparable between techniques.
Study [14]	Randomized Controlled	80 patients	The knotted Technique demonstrated significantly better stability than the knotless (p<0.05). Range of motion and patient-reported outcomes are similar.
Study [15]	Retrospective Cohort	200 patients	There is no significant difference in stability rates between knotted and knotless techniques. Range of motion and patientreported outcomes are comparable.

Limitations and Potential Sources

It is essential to remember that this research has several potential limitations. To begin, the study's retrospective nature creates the possibility of bias in the obtained data. The surgeon's personal preferences and the patient's unique characteristics likely induced some discrimination in the procedure results.

We conducted statistical studies to consider potentially confounding factors; nonetheless, some of them may have been missed because of our efforts. Because of the limited time for follow-up, it is possible that the long-term effects and potential problems of the two approaches need to be accurately documented. A long-term follow-up study is required because the repairs are expected to last long, and there may be late recurrences or issues.

Conclusion

This arthroscopic Bankart lesion repair technique comparison study emphasises the significance of providing personalised surgical care to patients. Although the knotted approach is more stable, it was shown that both the knotted and knotless procedures were equally beneficial in terms of patient satisfaction and flexibility of movement. Patients and their surgeons have to collaborate in decisionmaking, taking into account the pertinent clinical priorities and choices, to get the best possible outcomes.

Future Research

When planning future research in this area, it is essential to consider conducting prospective Randomised Controlled Trials (RCTs) with larger samples and more extended follow-up periods. A comparison of knotted vs. knotless procedures would benefit from using RCTs, lowering the risk of bias. Researching the effect of patient-specific variables on outcomes, such as age, activity level, and lesion size, could further refine the selection of the treatment method most beneficial for each patient. This could be accomplished by researching the relationship between patient-specific characteristics and outcomes.

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