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Knee & Shoulder Arthroscopy And Arthroplasty ISKSAA

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ISKSAA International Society for Knowledge for Surgeons on Arthroscopy and Arthroplasty

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Aims and Scope

Journal of Arthroscopy and Joint Surgery (JAJS) is committed to bring forth scientific manuscripts in the form of original research articles, current concept reviews, meta-analyses, case reports and letters to the editor. The focus of the Journal is to present wide-ranging, multi-disciplinary perspectives on the problems of the joints that are amenable with Arthroscopy and Arthroplasty. Though Arthroscopy and Arthroplasty entail surgical procedures, the Journal shall not restrict itself to these purely surgical procedures and will also encompass pharmacological, rehabilitative and physical measures that can prevent or postpone the execution of a surgical procedure. The Journal will also publish scientific research related to tissues other than joints that would ultimately have an effect on the joint function.

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Table of Contents

Original Articles

Case Reports

ISKSAA International Society for Knowledge for Surgeons on Arthroscopy and Arthroplasty

Wrightington, Wigan and Leigh NHS NHS Foundation Trust

Edge Hill University

ISKSAA – Wrightington International Training Fellowships leading to MCh degree (2021).

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3. **Having cleared the IELTS exam** before the interviews will be of advantage for final selections .
4. The Clinical posts would start in July 2021 although if candidates were to be interested for August 2022 start, they could still apply.
5. The MCh course is at the Edge Hill University and although most of the payment for the course can be made along the way in installments over the 2 years, there would be an initial Commitment of £8,000 to be made to secure the place before the formalities with Royal colleges and GMC are commenced at this End. The salary scales are detailed with the information sheet as well.
6. There will be two posts per year as the "Wrightington - ISKSAA MCh Fellowship". There would be an **assured Wrightington placement** during the 2-year UK rotation via this stream . **Only ISKSAA Life Members can apply for these posts** .
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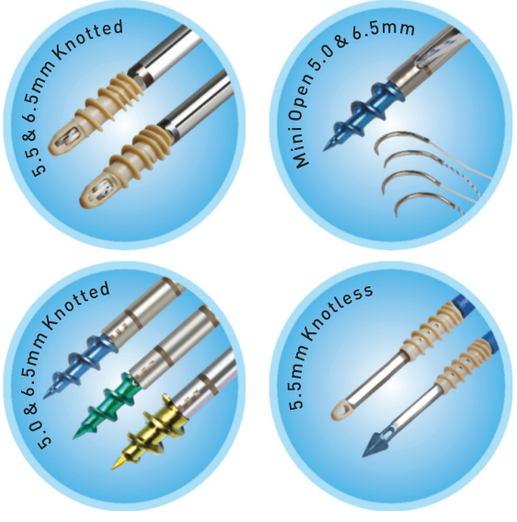
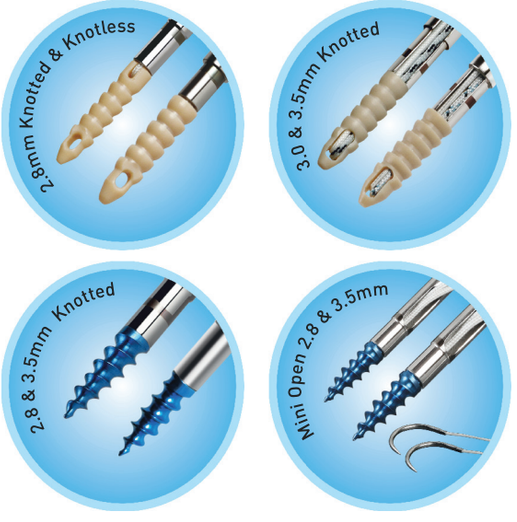


Suture Anchors for Slap & Bankart Repair



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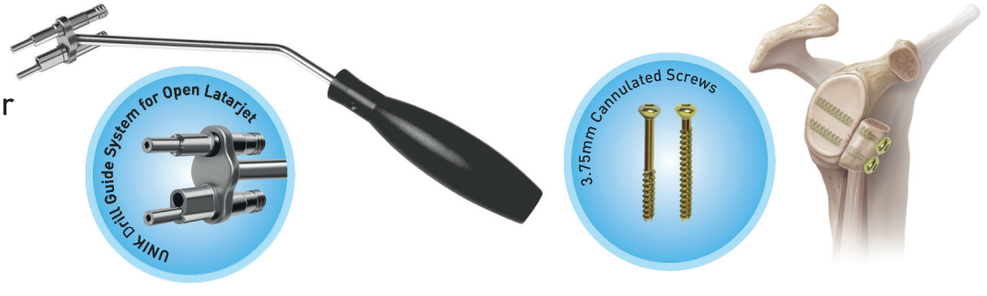

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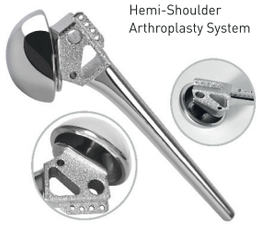

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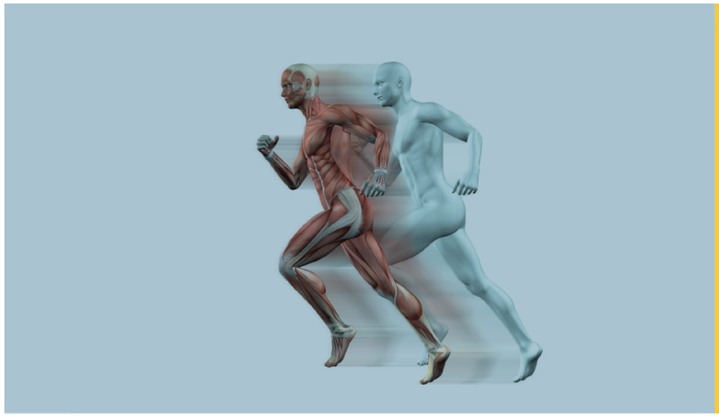

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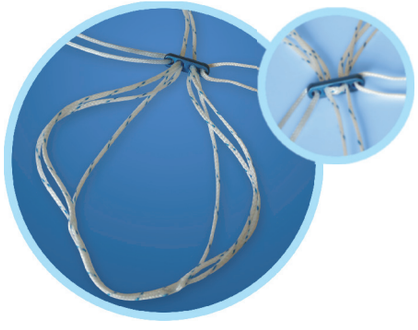

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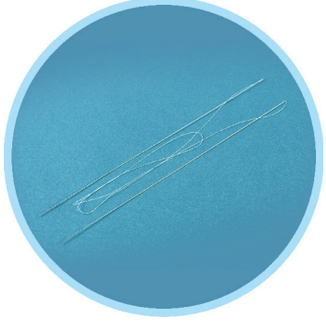

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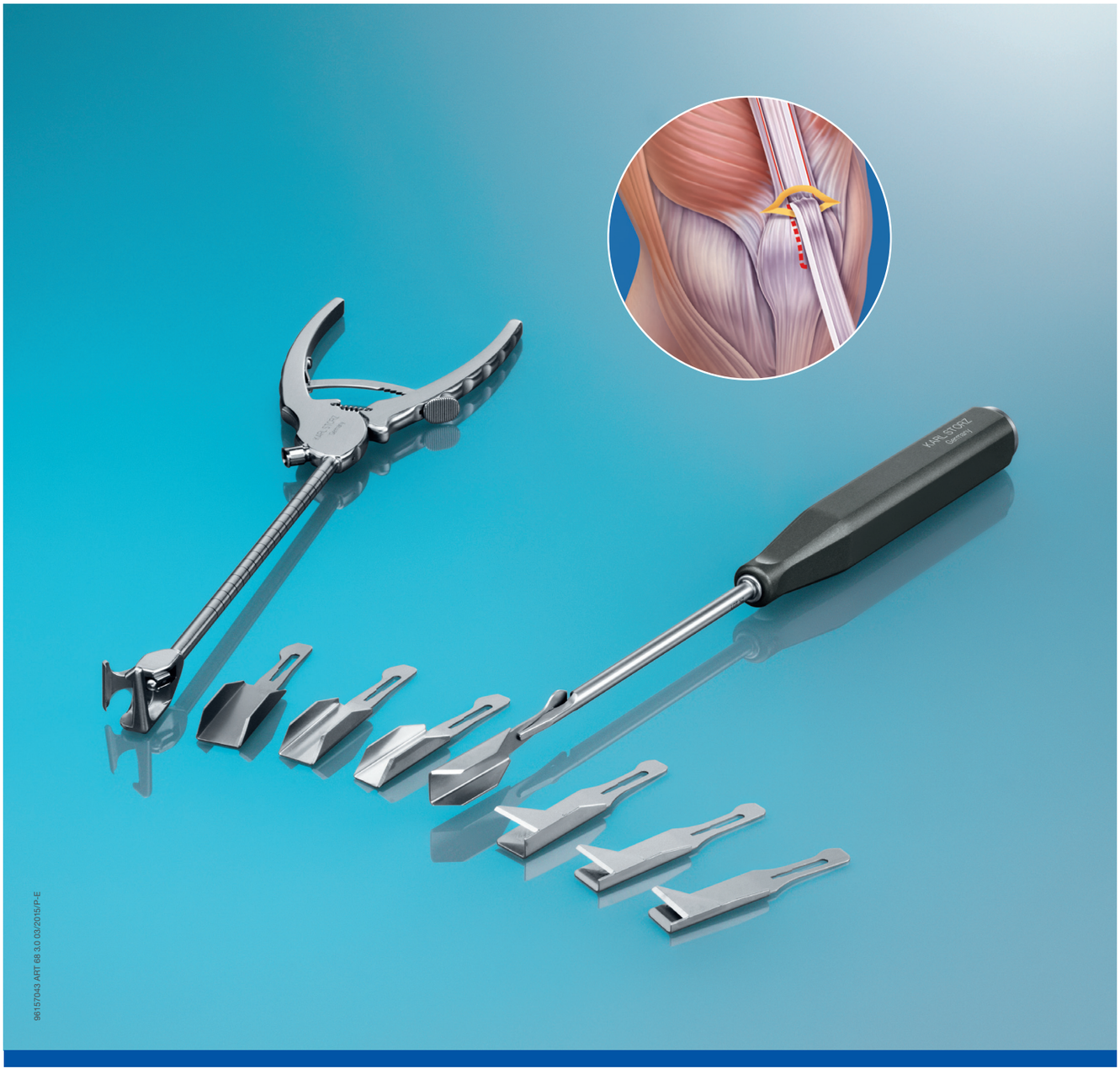

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Functional outcomes of trans-tendon repair vs. tear completion and repair for partial thickness rotator cuff tears: A metaanalysis

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ABSTRACT

Purpose: Surgical treatment for partial rotator cuff tears may include debridement of the tear, subacromial decompression or repair of the tear. Repair of the tear can be either in-situ repair, or completion of the tear followed by repair. Though it is agreed that surgical repair is required for tears more than 50% of the thickness of rotator cuff, there is no consensus on ideal surgical treatment of these cases. This systematic review and meta-analysis was carried out to compare functional outcomes following these two different surgical treatments of PTRC tears.

Methods: Search of electronic databases Google Scholar, PubMed, Ovid, and the Cochrane Register of Controlled Trials for published randomised controlled trials (RCTs) was undertaken. Search was done using a pre-designed search strategy. Critical appraisal of eligible studies was done for methodological quality using Cochrane Collaboration's tool. Functional scores used for meta-analysis were visual analogue scale for pain, Constant Score and American Shoulder and Elbow Surgeons shoulder score.

Results: Four studies reporting total 282 repairs were eligible to be included in the meta-analysis. No statistically significant difference was found between the two groups in terms of Constant Score and American Shoulder and Elbow Surgeons shoulder score. Results were significantly better in the trans-tendon repair groups in terms of re-tear rates. There was no significant difference in functional outcome scores between the two groups.

Conclusion: Tran-tendon repair technique may offer some benefits over tear completion and repair in terms of re-tear rates. Both techniques of surgical repair have shown equivalent functional outcomes at follow up. Current literature is insufficient to show superiority of one technique over the other.

1. Introduction

Partial thickness rotator cuff (PTRC) tears are more common than full thickness tears.[1,2] They may be difficult to diagnose on clinical examination as findings are often non-specific.[3,4] With the advent of magnetic resonance imaging and shoulder arthroscopy more and more PTRC tears are being identified and treated. Available evidence suggests that high grade PTRC tears (involving more than 50% of the tendon width) have better outcomes when treated with repair rather than debridement or subacromial decompression alone.[5,6] Options for repair of the tear are an in-situ repair, in which the torn portion of the tendon is approximated to the footprint leaving the intact portion attached, or completion of the tear followed by repair. It is not known that which of these two options is better for such tears. This systematic review and metaanalysis aims to compare functional outcomes following in-situ repair and completion of the tear followed by repair for PTRC tears. There are no existing systematic reviews of randomised controlled trials comparing these two techniques.

2. Material and methods

2.1. Review protocol

The 2009 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (www.prisma-statement.org)

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2214-9635/

were used to carry out this systematic review and meta-analysis.

2.2. Literature search

We searched Google Scholar, PubMed, Ovid, and the Cochrane Register of Controlled Trials for all published literature from January 2001 to 1st May 2018 using the following key words: "shoulder", "partial rotator cuff tears", "PASTA", "articular-sided rotator cuff tear", "incomplete rotator cuff tear", "arthroscopic" and "repair". These key words were combined in the search filed using appropriate Boolean operator 'AND'/'OR'.

2.3. Inclusion criteria

The eligibility criteria for inclusion the study in this systematic review were-

1. Randomised controlled trials
2. Partial (>50%) thickness tears of the supraspinatus tendon
3. Subjects belonging to either sex, any age and any country of origin
4. Functional outcome measures in terms of mean and standard deviation

2.4. Exclusion criteria

1. Tendon tears other than supraspinatus
2. Studies including full thickness tears
3. Studies managing tears conservatively
4. Associated injuries to shoulder
5. Cadaveric/biomechanical studies
6. Case reports, review articles

2.5. Study selection

Titles and abstracts of studies in the search results were assessed for possible inclusion in the systematic review by matching them against the inclusion and exclusion criteria. Full texts were retrieved for the studies that were shortlisted or in case of any ambiguity in the abstract. Two authors (TG & ST) carried out literature search individually and any discrepancy in results was resolved by mutual consensus. If there were two or more studies assessing the same functional outcome, they were considered for meta-analysis. References of all included studies were searched for any other potential study that could be included.

2.6. Data collection

Data was extracted on study design, patient demographics, tear characteristics, surgical procedure, and clinical outcomes using Microsoft Excel (2007).

2.7. Assessment of methodological quality

Two authors assessed methodological quality of the selected studies independently. Cochrane Collaboration's tool for assessing risk of bias was used for the assessment of bias in the included studies.[7]

2.8. Synthesis of results

Pooled outcomes data for the meta-analysis were analysed. Review Manager, Version 5.3 (The Nordic Cochrane Centre, The Cochrane Collaboration; Copenhagen, Denmark) was used for all analyses.

3. Results

3.1. Literature search results

Initial search yielded 1318 titles of which 970 studies were on humans and in English language. The PRISMA flow diagram for this search is shown in Fig. 1. Four studies were included in the systematic review.[8–11]

3.2. The characteristics of included studies

All included studies had reported level of evidence and all were level-2 studies. The details of the methodological quality of the included studies are listed in Fig. 2.

3.3. Functional scores

Four studies (282 rotator cuff repairs) compared functional outcomes between trans-tendon repair and tear completion with repair.[8–11] Results of comparison of functional outcome scores of various studies are summarised in Table 1. Details of surgical procedures, re-tear rates and complications are summarised in Table 2. One study[8] had expressed results in terms of difference in mean between the preoperative value and value at last follow up. Three studies had reported values before the surgery and at the last follow up.[9–11] Standard deviations of preoperative scores were not available for one of these studies[11] and it could not be pooled for analysis using difference in means. Thus, metaanalysis for functional scores (VAS and Constant Score) was done twice, once comparing difference in mean pre-operative score and the value at last follow up and second time comparing mean scores at final follow up between the two groups. Standard error of difference in means was calculated using formula, Standard Error (SE) = $\sqrt{S1^2/N1 + S2^2/N2}$.

3.4. VAS scores

Metaanalysis comparing difference in mean pre-operative VAS score and the value at last follow up was carried out for two studies[8,9] using fixed effect model (I2 = 0%; P = .33). Significant difference was found between the two groups (mean difference, 0.32; 95% CI, 0.15 to 0.49; P = .0003) (Fig. 3A).

Two studies were included in the metaanalysis using fixed effect model (I2 = 0%; P = .77) comparing mean VAS score at last follow up.[9,11] Significant difference was found between the two groups (mean difference, −0.1; 95% CI, −0.18 to −0.03; P = .007) (Fig. 3B).

3.5. Constant Scores

Metaanalysis comparing difference in mean pre-operative Constant score and the value at last follow up was carried out for three studies using random effect model (I2 = 86%; P = .0009).[8–10] No significant difference was found between the two groups (mean difference, −0.39; 95% CI, −2.11 to 1.33; P = .66) (Fig. 3C).

Three studies were included in the metaanalysis using random effect model (I2 = 80%; P = .0008) comparing mean Constant score

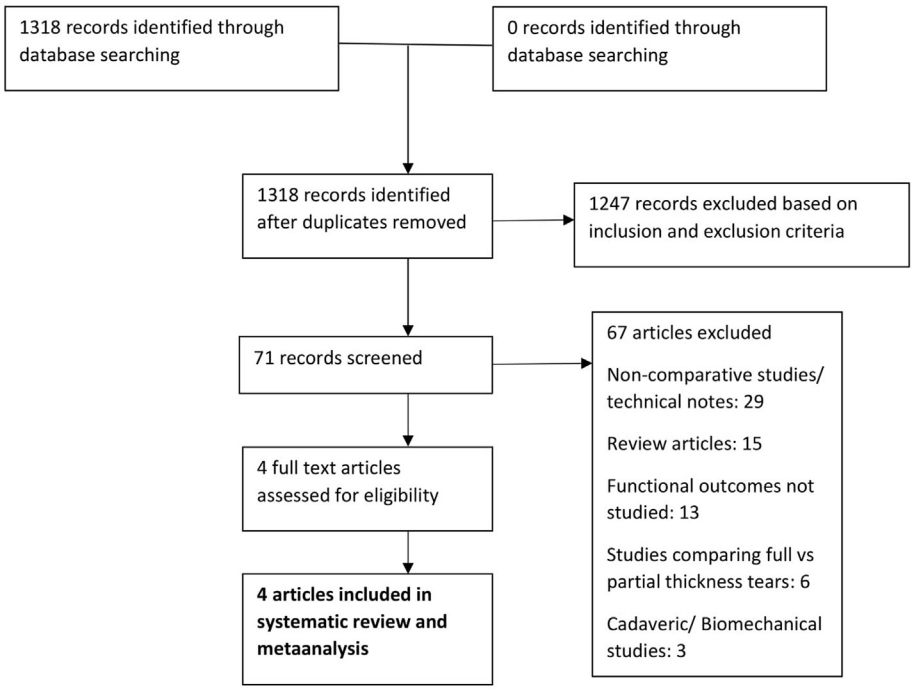

Fig. 1. PRISMA Flowchart describing the process of study selection and exclusion.

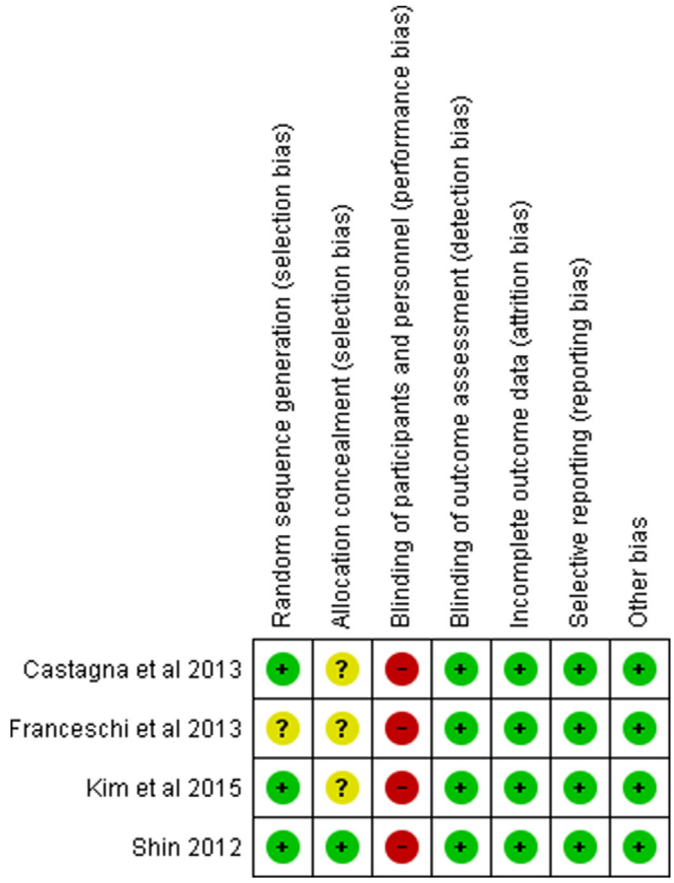

Fig. 2. Risk of bias graph for the studies included in meta-analysis.

at last follow up.[9–11] No significant difference was found between the two groups (mean difference, 1.79; 95% CI, −1.06 to 4.65; P = .22) (Fig. 3D).

3.6. American Shoulder and Elbow Surgeons (ASES) shoulder score

Three studies were included in the metaanalysis using random-effects model (I2 = 82%; P = .003) to compare mean ASES score at last follow up.[9–11] No significant difference was found between the two groups (mean difference, −0.27; 95% CI, −4.92 to 4.39; P = .91) (Fig. 3E).

3.7. Range of motion

Two studies were included in the metaanalysis using fixed-effects model (I2 = 0%; P = .97) to compare mean external rotation at last follow up.[9,10]No significant difference was found between the two groups (mean difference, −1.39; 95% CI, −3.19 to 0.42; P = .13) (Fig. 3F).

Two studies were included in the metaanalysis using random-effects model (I2 = 57%; P = .13) comparing mean forward flexion at last follow up.[9,10] No significant difference was found between the two groups (mean difference, −0.97; 95% CI, −5.28 to 3.34; P = .66) (Fig. 3G).

3.8. Re-tear rates

Two studies were included in the metaanalysis using random-effects model (I2 = 0%; P = .92) comparing re-tear rates between two groups.[9,11] Significant difference was found between the two groups (odds ratio, 0.21; 95% CI, 0.05 to 0.93; P = .04) (Fig. 3H).

3.9. Sensitivity analysis

Sensitivity analysis showed that results of ASES scores were significantly better in favour of tear completion and repair group if the study by Kim et al.[11] was excluded. No other findings were noted on sensitivity analysis.

Table 1
Comparison of functional outcome scores in studies included in systematic review.

Author, Year	Sample size Table 1: Comparison of functional outcome scores in studies included in systematic review	Outcome Scores & Range of Motion	GROUP I (Transtendon Technique)			GROUP II (Tear Completion Repair)			Statistically significant intergroup difference at Final follow up
			Preoperative	Final Follow-up	Statistical difference (Preop to Final follow up)	Preoperative	Final Follow-up	Statistical Difference (Preop to Final follow up)	
Shin 2012	48	Pain score (VAS)	5.5 ± 0.6	1.4 ± 0.4	Yes	5.3 ± 0.5	1.1 ± 0.2	Yes	No
		ASES score	50.8 ± 4.3	89.1 ± 2.1	p < .001	49.2 ± 4.2	86.2 ± 3.2	p < .001	
		Constant score	54.8 ± 2.6	84.8 ± 2.7	p < .001	59.0 ± 3.9	87.1 ± 2.4	p < .001	
		Forward Flexion	141.8 ± 5.6	167.8 ± 5	p = .010	136.7 ± 6.3	170.4 + 3.2	p = .003	
		External Rotation	49.7 ± 5.4	65.2 ± 4.4	p = .007	46.1 ± 4.8	66.6 ± 2.0	Yes	
		Internal Rotation (spinal level)	L3	L1/T12	p = .013	L3	L1/T12	Yes	
Franceschi et al., 2013	60	ASES score	45.6 ± 8.1 (29–71)	91 ± 6.6 (74–100)	p = .0001	47 ± 10.6 (25–72)	90 ± 7.9 (71–100)	p = .0001	No
		Constant Murley score	48 ± 8.2 (30–72)	92 ± 7.1 (72–100)	p = .0001	47 ± 8.6 (29–63)	91 ± 7.3 (72–100)	p = .0001	
		Forward Flexion	132.8 ± 13 (95–162)	171 ± 10.4 (150–190)	p = .0001	129.2 ± 18.2 (90–160)	169 ± 10.9 (145–190)	p = .0001	
		External Rotation	45.6 ± 14.5 (15–70)	59.8 ± 9.6 (45–80)	p = .0001	50.3 ± 12.7 (20–75)	61.1 + 10.2 (40–85)	p = .001	
		Internal Rotation (spinal level)	a level between L3-S1	23 ptsT8; 7 pts T9; 2 pts T10		a level between L3-S1	21 pts T8; 5 pts T9; 2 pts T10		
Castagna et al., 2013	74	Pain score (VAS)		Increase by a mean of 3.4 (SD 1.2)	p < .0001		Increase by a mean of 3.6 (SD 1.7)	p < .0001	No
		Constant score		Increase by a mean of 25.1 (SD 5.8)	p < .0001		Increase by a mean of 29 (SD 6.2)	p < .0001	
Kim et al., 2015	100	Pain score	5.9	2.6 + 2.2	p = .001	7	1.9 ± 1.6	p = .001	No
		ASES score	55	80.6 ± 15.6	p < .001	49	87.1 ± 9.9	p < .001	
		Constant score	59	71.1 ± 4.1	p < .001	59.9	71.1 ± 6.1	p < .001	
		SS score	55	79.2 ± 21.4	p = .001	56	88.2 ± 13.4	p = .001	
		KSS	50.5	70.5 ± 28.2	p < .001	48	80.7 ± 25.8	p < .001	

SD, Standard Deviation; VAS, visual analogue scale; ASES, American Shoulder Elbow Society; SS, Simple Shoulder; KSS, Korean Shoulder Score; T, Thoracic vertebra; L, Lumbar vertebra.

Table 2
Comparison of included studies for type of procedure, re-tear rates and complications.

Author, Year, Journal	Type of index procedure	Additional procedures done (if any)	Functional outcome score used	Retear rates	Complications
Shin 2012	Simple knot tying (Group I), Trans-osseous equivalent (Group II)	Debridement for Subscapularis partial tears 8 (GrI), 10 (GrII), Acromioplasty as needed Acromioplasty 4 (GrI), 7 (GrII)	ASES score, Constant shoulder score, Pain score (VAS)	Group I:0, Group II: 2	Post op Adhesive capsulitis 3(Group I), 2 (Group II)
Franceschi et al., 2013	Simple knot tying (Group I), Trans-osseous equivalent (Group II)	Acromioplasty for Osteophytes and Hook shaped acromion	ASES score, Constant shoulder score	Group I:1, Group II: 1	Post op Adhesive capsulitis 3(Group I), 3(Group II)
Castagna et al., 2013	Simple knot tying (Group I), Trans-osseous equivalent (Group II)	NA	Constant shoulder score, Pain score (VAS)	NA	NA
Kim et al., 2015	Trans osseous (Suture Bridge) technique for both groups	Acromioplasty as needed	ASES score, Constant shoulder score, SS, KSS,Pain score (VAS)	Group I:2, Group II: 7	NA

NA- information not available.

4. Discussion

PTRC tears have poor spontaneous healing due to hypovascularity in the region of tear and continuous tensile forces acting in the region.[12,13] Progression to full thickness tears may occur in 28% of patients conservatively managed patients in 1 year.[14] Clinical signs and symptoms of PTRC tears are non-specific and may mimic those of impingement and rotator cuff tendinitis.[4,5] Since PTRC tears may also be present in asymptomatic people and its management remains controversial, an initial conservative approach is preferred.[15] Surgical treatment is indicated in patients not responding to conservative treatment. Debridement alone, without cuff repair had also been used in treatment of PTRC tears, but repair of the cuff tissue is preferred to restore anatomy and prevent tear progression.[16,17]

There is no consensus on technique of treatment of these PTRC

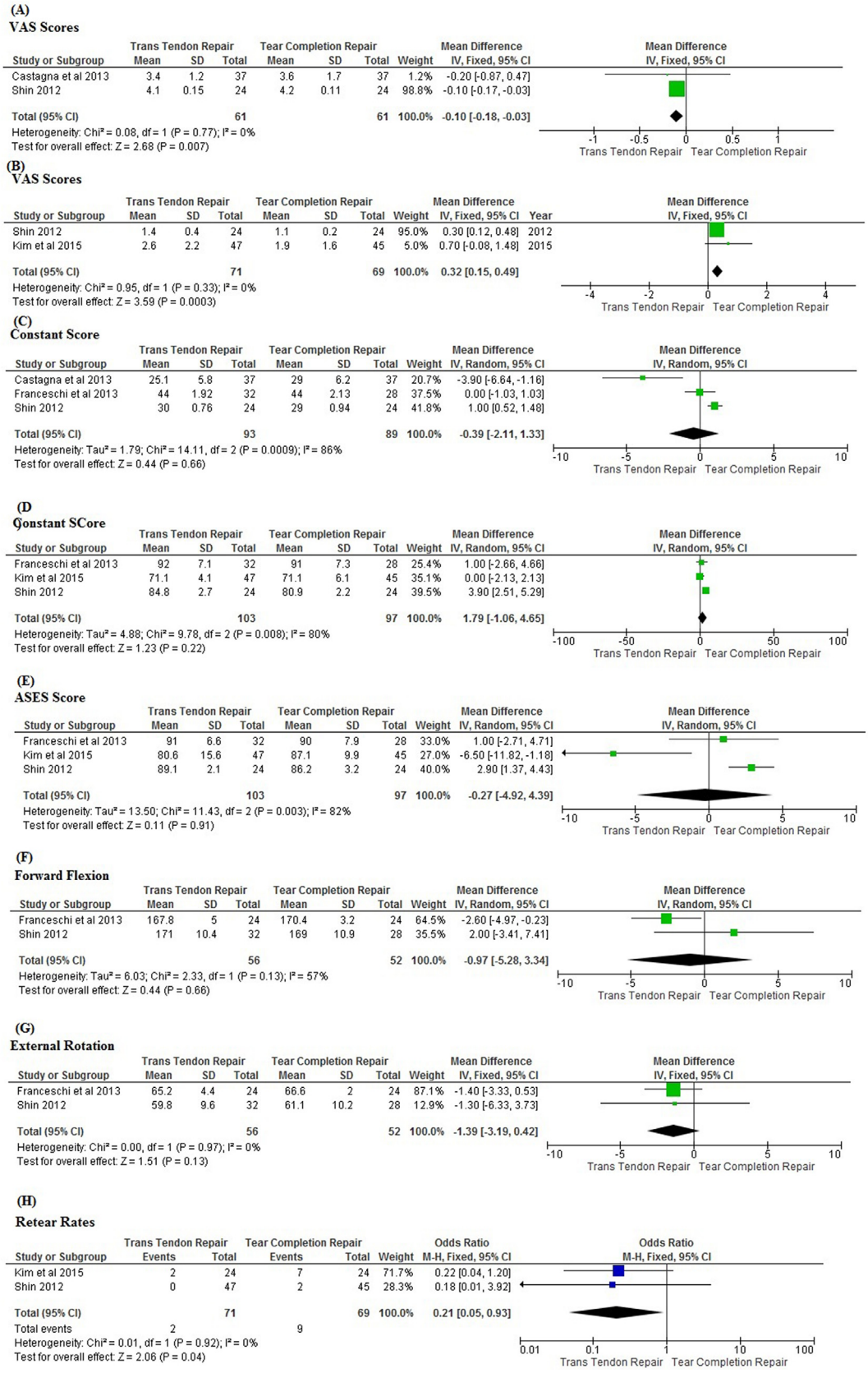

Fig. 3. Forest Plots for the outcomes (A) difference in mean pre-operative VAS score and the value at last follow up (B) mean VAS score at last follow up (C) difference in mean pre-operative Constant score and the value at last follow up (D) mean Constant score at last follow up (E) ASES score (F) Forward Flexion (G) External rotation (H) Re-tear rates.

tears. Studies comparing outcomes between different surgical techniques are few and there is no metaanalysis of these outcomes. This metaanalysis showed that trans-tendon technique results in better pain scores at final follow-up compared to tear completion and repair. There was no difference between the functional outcome scores (Constant Score and ASES) or range of motion at final follow up between the two techniques. Re-tear rates were significantly less in the trans-tendon group.

PTRC tears may also occur in patients engaged in overhead sports. Only Franceschi et al. had reported comparative return to sports in both the groups.[10] In trans-tendon repair group 75% of the patients could return to original sports whereas in tear completion and repair group 67% patients could return to original sports. This difference was not statistically significant.

There are many non-comparative studies reporting outcomes after either transtendon repair or tear completion and repair, and there are systematic reviews of these studies.[18,19] But these systematic reviews are of poor quality as they have combined studies of diverse methodological qualities and inclusion criteria had not been explicit. Literature search in these reviews also appear to be incomplete as some studies satisfying inclusion criteria have also missed. This is the first systematic review combined with meta-analysis of RCTs comparing the two techniques. Katthagen et al.[18] conducted a systematic review (Level IV) on PTRC tears. They included total 19 studies of which 11 were Level IV, 5 were Level III and 3 were Level II. These were studies with different objectives and methodologies. Only two studies were included in quantitative synthesis. Ono et al.[19] included only there studies in their meta-analysis. They had a good methodology and their results did not show a difference between two techniques in terms of functional outcome scores, range of motion, retear rates or complications.

This meta-analysis has some limitations. Firstly, there is relative lack of literature on this comparison resulting in a limited data for this metaanalysis. Another limitation of this study is that both articular and bursal side tears were included. Duration of follow up of participants is variable in the studies and the total numbers are relatively small. None of the studies included a comparison with a control group where either no surgical treatment or only decompression was carried out. Studies were also heterogeneous in terms of surgical technique used. Kim et al. used suture bridge repair in both the groups whereas others had used simple knot tying for trans-tendon repair and suture bridge repair for tear completion and repair. Sub-acromial decompression was also varyingly used in these studies.

5. Conclusion

Tran-tendon repair technique may offer some benefits over tear completion and repair in terms of re-tear rates. Both techniques of surgical repair have shown equivalent functional outcomes at follow up. Current literature is insufficient to confirm superiority of one technique over the other. More high quality randomised controlled trials are needed for making a stronger conclusion on this topic.

Declaration of competing interest

None.

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Research paper

Medium term outcomes of all-suture soft anchors in arthroscopic shoulder stabilisation

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ABSTRACT

Background: There are few studies reporting the outcomes from arthroscopic shoulder stabilisation using all-suture soft anchors. The aim of this study was to assess the clinical outcomes and failure rate for arthroscopic shoulder stabilisation using these anchors.
Methods: A retrospective cohort analysis of a consecutive series of patients in a single unit undergoing arthroscopic shoulder stabilisation using JuggerKnot all-suture soft anchors by four consultant shoulder surgeons was performed. Exclusion criteria were revision procedures, engaging Hill-Sachs lesions and glenoid bone loss greater than 20%. The primary outcome measure was failure (dislocation or subluxation as perceived by the patient with subsequent revision surgery). The secondary outcome measure was function as assessed by the Oxford Shoulder Instability Score (OSIS).
Results: 67 patients with a mean age at the time of surgery of 32.6 years (range 15–55 years) met the inclusion criteria. Median follow up was 34.5 months (minimum 13 months). No patient experienced a postoperative dislocation. However, three patients experienced painful subluxations; two underwent revision arthroscopic stabilisation and one required open stabilisation due to glenoid bone loss. Consequently, failure rate was 4.5%. Mean post-operative OSIS was 39/48 (n = 49).
Conclusion: This series supports the use of all-suture soft anchors in arthroscopic shoulder stabilisation. The failure rate compares favourably with that previously reported in literature for conventional anchors.
Level of evidence: Level IV: Case series with no comparison group.

1. Introduction

Arthroscopic stabilisation techniques have evolved since the use of metallic screws and staples[1] which cause interference with computed tomography (CT) and magnetic resonance imaging (MRI)[2] and carry the risk of loosening and migration towards the articular surface[3] causing chondral damage.[2,4] The gold standard therefore became the suture anchor,[5] including non-resorbable polymer anchors such as the polyether ether ketone (PEEK) anchor and biocomposite anchors composed of bioabsorbable polymers such as poly (L-lactide) and osteoconductive calcium.[6] Bioabsorbable anchors however have been associated with early degeneration resulting in the anchor becoming a loose body[7] as well as osteolysis and articular destruction.[8]

Novel all-suture soft suture anchors were developed to avoid these risks with the benefit of removal of less bone during tunnel drilling and occupying less volume.[9] Evidence supports the use of a higher number of suture anchors leading to a stronger repair with less than three anchor points significantly risking recurrent instability following arthroscopic anterior labral repair.[10,11] A strong bone conserving anchor is therefore ideal given the risks of an increased number of anchors on a limited available bony surface area, especially in revision cases which carry a higher risk of failure of fixation, glenoid fracture and bone loss. One such anchor is the suture soft "JuggerKnot" anchor (Biomet, Warsaw, IN, USA), which was introduced in 2009. Recent biomechanical studies have demonstrated similar load-to-failure characteristics for the all-suture soft suture anchors compared with more traditional anchors.[9,12,13]

Despite favourable biomechanical evidence, the clinical efficacy of all-suture soft anchors is unknown.[14,15] Few clinical outcome

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studies have been reported and patient numbers have been small and the duration of follow-up limited.[16,17]

The aim of this retrospective cohort study was to assess the failure rate (dislocation, instability symptoms and revision surgery) and the clinical outcome of arthroscopic labral repair using the all-suture soft JuggerKnot anchor at a minimum of 12 months follow-up.

2. Methods

2.1. Study design and study population

A retrospective cohort study was performed. Inclusion criteria were all patients from a single unit undergoing arthroscopic shoulder stabilisation for primary traumatic instability using JuggerKnot Soft Anchors (Biomet, Warsaw, IN, USA) since their introduction to the unit from October 2011 to October 2017. Patients were identified using a prospectively collected database containing diagnosis and procedural information both from clinic and the operating theatre from 2001 onwards. Information was entered onto the database on a case-by-case basis by a data entry team using case notes and theatre logs. The database was searched and case notes were requested for retrospective analysis and extraction of outcome data. Patients were informed about the study via mail and invited to return a survey questionnaire. If no reply was received then patients were contacted by telephone.

Exclusion criteria were revision procedures, engaging Hill-Sachs lesion on arthroscopy and significant glenoid bone loss (greater than 20%) at the time of procedure. Those undergoing an associated rotator cuff repair at the time of surgery were also excluded.

All patients had completed a minimum of 6 months of non-surgical treatment comprising of supervised outpatient physiotherapy. The decision to proceed to surgical stabilisation was based on pain and instability symptoms as well as number of dislocations and risk of recurrence. All procedures were performed by a fellowship trained consultant shoulder surgeon or senior trainee under direct consultant supervision.

2.2. Surgical procedure

Regional or general anaesthetic was used. Patients were placed in a beach chair position with extremity draping and the arm left free. A standard posterior arthroscopic viewing portal was first established and a dry arthroscopy of the glenohumeral joint was performed to assess for the presence of a Hill-Sachs lesion and if this was an on track or engaging lesion. Glenoid bone loss was then assessed to determine if arthroscopic stabilisation was appropriate (less than 20% bone loss). Anterior portals were then created within the rotator interval and two arthroscopic cannulae inserted. The labrum was prepared using a radiofrequency ablationtool radiofrequency tool and rasp to release all portions of the capsulolabral complex from the scapula neck and achieve a bleeding bone surface. The full width of the labrum was reattached to the debrided glenoid neck using all suture anchors (JuggerKnot, Biomet, Inc. Warsaw, IN, USA). The anchors were positioned at 5, 4 and 3 o'clock; when an additional anchor was needed, the 2 o'clock position was used. The technique of implanting the all-suture anchor involved drilling a 12 mm deep pilot hole with a 1.4 mm Kirschner-wire on the face of the glenoid and introducing the all-suture soft anchor loaded with a single Max-braid suture through a guide. Sutures were passed through the labrum and the inferior glenohumeral ligament was reformed and tensioned with sliding locking knots tied and laid carefully behind the labrum, shifting the capsulolabral complex superiorly and recreating the labral bumper. Patients were placed in a broad arm sling for 4 weeks and discharged the same day.

2.3. Rehabilitation protocol

All patients were visited by a physiotherapist on the ward prior to discharge. They were instructed to wear a broad arm sling continuously for the first four weeks with the exceptions of washing, dressing, eating and performing specific exercises. These include active elbow, wrist & hand movements, pendular shoulder movements and active assisted shoulder movements within a safe zone (typically 90° flexion/abduction and 30° external rotation unless specified otherwise in the individual post-operative plan). Patients attended the outpatient physiotherapy clinic within two weeks to re-iterate the instructions, assess for complications and reassure. The sling was discarded at four weeks with progression to full range active movements as pain allowed but avoiding aggressive stretching especially into external rotation. Low load isotonic strengthening was commenced along with low load weightbearing proprioception exercises. By six weeks the aim was to commence the Derby Shoulder Instability Rehabilitation Programme as detailed by Bateman et al.[18] Higher level athletes aimed to complete the programme whereas patients with lower physical demand continued until an accepted level of function was achieved. Contact sport was restricted until six months post-surgery.

2.4. Follow-up

Patients had clinical follow-up with the treating surgeon until a minimum of 12 months following surgery. Patients were asked if their shoulder felt stable and if they had any further episodes of dislocation or perceived subluxation. Shoulder function was assessed using the Oxford Shoulder Instability Score (OSIS).[19,20] The OSIS is a 12-item patient-reported measure of shoulder dislocation and subluxation with scores ranging from excellent 0 to 48, with 48 being the best outcome. It is condition specific and validated for measuring surgical outcomes for patients presenting with instability of the shoulder and has a minimum clinically important difference of 4.5 points.[21,22] Patients returned an OSIS independently at each clinic attendance without assistance from the treating surgeon.

No institutional review board or ethical approval was required for this study as data was prospectively collected as part of normal practice and service evaluation in our department with retrospective analysis performed.

2.5. Statistical analysis

Descriptive statistical analysis was performed using Statistical Package for the Social Sciences (SPSS Statistics for Mac, version 23.0; SPSS, Inc., Chicago, IL, USA).[23] Pearson's correlation analysis was performed to compare the number of preoperative dislocations and postoperative OSIS; $p < 0.05$ was considered statistically significant.

3. Results

67 patients met our inclusion criteria (Fig. 1). The mean age at the time of surgery was 32.6 years (SD 9.5, range 15–53). The median number of previous dislocations of the treated shoulder was 2 (IQR2, range 1–8).

Labral repairs were anterior in 63 cases, posterior in 2 cases and combined anterior and posterior in 2 cases. 13 patients also underwent simultaneous superior labral repair. The mean number of anchors used was 3.1 (SD1.1, range 1–5).

The duration of clinical follow up was a median 34.5 months

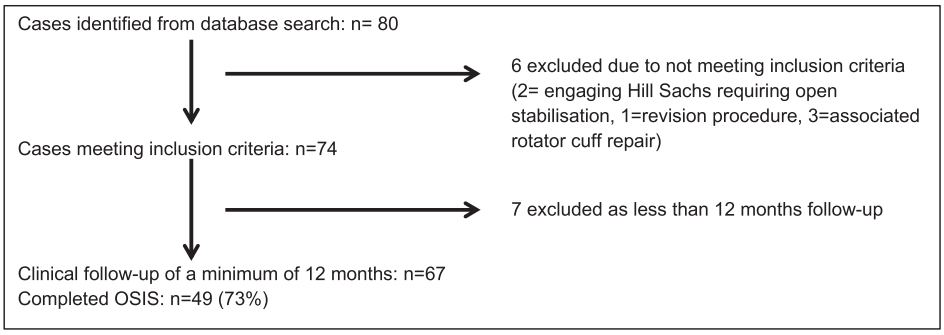

Fig. 1. Patient flowchart.

(IQR 37, range 13–84). The mean postoperative OSIS was 39.0 (SD9.2). Insufficient data was available from preoperative clinical records therefore no comparative analysis of preoperative functional scores was performed. There was no significant correlation between the number of dislocations before surgery and OSIS (Pearson's $R = 0.56$, $P = 0.74$).

There were three failures (4.5% of cases); none due to dislocation. One 21-year-old male patient treated with arthroscopic stabilisation following a traumatic dislocation experienced subluxation episodes six months following surgery and was treated with an open stabilisation due to CT proven glenoid bone loss. One 20-year-old male patient returned to boxing one year after arthroscopic stabilisation for a traumatic dislocation; arthroscopic assessment revealed intact suture anchors however the anterior labrum had torn through the sutures. Repeat arthroscopic stabilisation using JuggerKnot anchors was successful. One 28-year-old male patient had perceived instability 1 year following arthroscopic stabilisation for atraumatic instability. MRI was equivocal and a diagnostic arthroscopy revealed a deficient anterior labrum that was treated with revision arthroscopic stabilisation using JuggerKnot anchors successfully.

6 patients had a postoperative MRI, including the three failures. Two of these cases symptoms did not require revision surgery and improved with physiotherapy alone; one patient experiencing pain attributed to scapulothoracic dyskinesia and one patient following subsequent trauma. Tunnel widening or adjacent cysts were not identified in any cases.

One patient death occurred in the follow up period. This fatality was not related to their procedure.

4. Discussion

The aim of this retrospective cohort study was to assess the clinical outcome and failure rate of arthroscopic labral repair using the all-suture soft JuggerKnot anchor at a minimum of 12 months follow-up. We found at a median 34.5 months a mean OSIS of 39.0/48. There were 3 failures (4.5%).

Few studies have reported the clinical outcomes from labral repair using all-suture soft anchors. A recent prospective study of 30 patients using the JuggerKnot anchor by Tompane et al. monitoring for glenoid reactions using CT scanning found increased tunnel volumes at 6 and 12 months; however, this is of unclear significance as there were no episodes of recurrent instability during study period.[24] Agrawal et al. studied a series of 18 patients treated for circumferential labral tears and found at a mean 2-years follow-up improved Constant-Murley shoulder scores and Flexilevel shoulder function scores with one failure due to further trauma in a competitive athlete at 3 years and no instances of subchondral cyst formation or tunnel expansion.[16] Willemot et al. studied a series of 20 patients treated with the JuggerKnot anchor with minimum 12-month follow-up (mean 19 months) and found satisfactory Western Ontario Shoulder Instability (WOSI) Index and Disabilities of the Arm Shoulder and Hand and Constant-Murley scores and no cases of subluxation or dislocation.[17] There were some bone reactions but these were few and low grade on MRI. These studies all had small numbers and short follow-up duration however. Tunnel widening or adjacent cysts were not identified in any cases in this study, although it was not routine to perform postoperative cross sectional imaging in our unit.

Functional outcome was found to be similar to that from traditional anchors with a mean OSIS of 39.0 (SD9.2). A recent prospective study by Blonna et al. of 30 patients undergoing arthroscopic Bankart repair at minimum 2-year follow-up using bioabsorbable suture anchors reported an OSIS of 41 and a revision rate of 4.9%.[25]

Survival was good (95.5% at 1 year), although longer follow-up is required to compare directly to more traditional anchors. Vermeulen et al. studied a series of 147 patients treated with absorbable polylactic acid knotless anchors at a mean 6.3 years found 5-year survival of 79% and good long term results as assessed using the WOSI index.[26] The authors found no complications, although other authors have found rare complications such as chondral injury,[27] disintegration[28] and osteolysis around anchors.[29] There are no such long-term studies of all-suture soft suture anchors although biomechanical studies have shown similar load-to-failure performance to other anchor designs.[9,12,13] With a smaller footprint on the bony surface and the ability to place anchors as close as 2 mm from one another without reducing strength to failure,[30] all-suture soft anchors provide an ideal solution to offer more fixation points which is known to lead to a stronger repair.[10,11]

Limitations of this study included the lack of preoperative outcome scores for comparative analysis. This was because a preoperative OSIS was not available for a significant proportion of patients, therefore we accept this limitation and report a full consecutive series of patients and avoid a potential source of selection bias. 18 patients (27%) declined to return postoperative OSIS questionnaires; however, all patients completed a minimum clinical follow-up of 12 months. It was not routine practice in our unit to perform postoperative MRI imaging if the patient was asymptomatic therefore we cannot comment on labral healing or bone reactions.

Strengths of this study include that this is the largest study reporting clinical outcomes data from patients treated using all-suture soft anchors with minimum 12-months follow-up and is a multi-surgeon consecutive series.

The low failure rate and good clinical outcomes reported support the ongoing use of all-suture soft anchors. Further long-term studies are required to determine clinical outcome as compared

to more traditional suture anchors.

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