


OPERATIVE TECHNIQUE

Modified Double-Row and Double-Pulley Technique for the Treatment of Type Ia Scapular Glenoid Fractures

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Abstract

Objective: To evaluate the efficacy of the double-row and double-pulley technique in treating anterior shoulder glenoid fracture (Ideberg type Ia) using shoulder arthroscopy.

Methods: Thirty-six patients with Ideberg type Ia admitted from March 1, 2017, to March 1, 2020, were retrospectively reviewed. Data of the patients' history included age, sex, side of the affected arm, the mean time from injury to surgery, the surgical duration, the average blood loss, and the average total duration of hospital stay. The double-row and double-pulley technique was used to repair the scapular glenoid fracture under arthroscopy. Computed tomography (CT) was used to evaluate fracture healing after surgery. The American Shoulder and Elbow Surgeons (ASES) score, the University of California at Los Angeles (UCLA) shoulder joint scoring system, and the Constant–Murley shoulder function score were used to assess the function of the affected shoulder.

Results: The surgical duration was 90–150 min, with a mean of 127 min. The average blood loss was 90 mL (range, 60–120 mL), and the average total duration of hospital stay was 9.2 days (range, 3 to 14 days). At 9 months after surgery, the CT results showed that all fractures healed, and all patients returned to their previous levels of activity and regained an excellent range of motion. The visual analog scale (VAS) score was 7.55 ± 1.32 before surgery, and the VAS score significantly decreased to 1.24 ± 0.72 at 12 months after the operation ($p < 0.05$). The Constant, ASES, and UCLA shoulder function scores were 44.38 ± 2.16 , 43.47 ± 12.76 , and 21.80 ± 1.16 before the surgery, respectively, which improved to 93.52 ± 2.82 , 91.34 ± 8.28 , and 33.24 ± 1.64 , respectively, in the following 12 months. One patient experienced fat liquefaction. However, no cases of deep venous thrombosis, iatrogenic neurovascular compromise, wound infection, or neurovascular injury were identified.

Conclusion: The double-row and double-pulley technique for treating Ideberg type Ia under shoulder arthroscopy has minor surgical trauma, reliable fracture reduction and fixation, less postoperative pain, and fewer postoperative complications and significantly improves the patient's shoulder joint function.

Key words: Arthroscopic technique; Double-row and double-pulley technique; Scapular glenoid fracture

Introduction

Scapular glenoid fracture is a rare intra-articular fracture that accounts for 0.4%–1% of all fractures. Direct high-energy impact is the most common injury mechanism for

scapular glenoid fractures. The bone fragments are prone to displacement due to muscle and ligament tension.¹ The incidence of scapular glenoid fracture during a first anterior shoulder dislocation is 8.6%.² Furthermore, scapular glenoid

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fracture will affect the stability of the shoulder joint, resulting in subluxation or dislocation of the glenohumeral joint, if not treated in time or untreated. With the increase in the number of dislocations, the incidence of fracture increases to 20%.³ Instability of the shoulder joint ultimately leads to glenohumeral joint arthritis.^{4,5} Therefore, the reduction and internal fixation of scapular glenoid fractures is significant for the restoration of shoulder joint function.

It is widely accepted that isolated glenoid fracture with a large fragment, displacement more than 10 mm, or associated instability, should be operatively treated.⁶ Several treatment options have been reported to manage these scapular glenoid fractures, including conservative treatment, open reduction and internal fixation, and arthroscopic fixation. Considering the scarcity of this injury pattern, we could only find a few case reports or case series.⁷⁻⁹ To date, there is no consensus on which treatment option is preferable.

The complex anatomical structure around the scapula is a huge challenge to the open reduction and internal fixation (ORIF) of scapular fractures. Therefore, ORIF treatment of scapular glenoid fractures faces high-risk iatrogenic injuries and adverse consequences due to insufficient exposure, including unsatisfactory reduction and fixation, excessive separation of the subscapular muscles, a reduced postoperative range of motion, pain, and shoulder joint instability. In addition, ORIF surgery cannot fully repair other joint structures, thus affecting the postoperative function of the patient's shoulder joint.^{10,11} In the past, it was thought that a large bone block of the shoulder joint was not suitable for arthroscopic surgery,¹² but with the development of shoulder arthroscopy techniques, an increasing number of fractures can be repaired well under the microscope,^{13,14} including fixation with screws¹⁵ and transglenoid suture fixation¹⁶ with suture anchor fixation.¹⁷

Many authors prefer ORIF techniques for the treatment of this type of injury.¹⁸ However, it has been reported that the treatment of scapular glenoid fractures under arthroscopy has achieved suitable medium- and long-term clinical results.¹⁹ Anterior shoulder glenoid fracture (Ideberg type Ia) is an anterior edge fracture in the scapular glenoid, which is more conducive to surgical treatment under arthroscopy due to its particular fracture location.

The purpose of this study was to (i) use the double-row and double-pulley technique to fix the scapular glenoid fracture, which binds the bone blocks without passing through the bone blocks and overcomes the shortcomings of traditional point-like contact, avoiding the possibility of additional fracture; (ii) retrospectively analyze the preliminary effect of the modified double-row and double-pulley technique on Ideberg type Ia; and (iii) provide support and guidance for the clinical treatment of Ideberg type Ia and evaluate the effect of minimally invasive and reliable fixation on patients' early shoulder rehabilitation exercise.

Materials and Methods

Data Sources

Thirty-six patients with Ideberg type Ia admitted from March 1, 2017, to March 1, 2020, were selected as the study subjects. Inclusion criteria: patients who (i) had anterior shoulder glenoid fracture (Ideberg type Ia); (ii) underwent shoulder arthroscopic surgery by double-row and double-pulley technology in our institution from March 1, 2017, to March 1, 2020; and (iii) were followed for a minimum of 1 year. Exclusion criteria: (i) magnetic resonance imaging (MRI) suggested a rotator cuff tear or other fractures (except Hill-Sachs injury of the humeral head), pathological fractures, shoulder degenerative diseases, or shoulder dysfunction; (ii) systemic diseases such as rheumatoid arthritis; (iii) soft tissue injury, such as ligament injury or soft tissue detaching injury of the shoulder joint.

The patients' information is shown in Table 1. The range of shoulder motion was measured before surgery, and the function of the shoulder joint was evaluated using the Visual Analog Scale (VAS), Constant, American Shoulder and Elbow Surgeons (ASES) score, and University of California at Los Angeles (UCLA) scales.

Surgical Technique

Anesthesia and Position

All patients were given general anesthesia. The patient was placed in a lateral position (Figure 1A, B), the limbs were disinfected, and the arm traction was 3–5 kg.

Table 1. Characteristic of patients (n = 36)

Characteristics	N (%) (n = 36)
Gender	
Male	25 (69.44)
Female	11 (30.55)
Age (years)	
16–30	11 (30.55)
31–45	12 (30.55)
46–60	13 (36.11)
61–66	1 (2.77)
Right/Left shoulder joint	
Right	28 (77.78)
Left	8 (22.22)
The mean time from injury to surgery (days)	
4–5	7 (19.44)
6–7	20 (55.56)
8–9	9 (25.00)
The surgical duration (min)	
90–110	6 (16.67)
111–130	21 (58.33)
131–150	9 (25.00)
Blood loss (mL)	
60–80	10 (27.78)
81–100	19 (52.78)
101–120	7 (19.44)
Total duration of hospital stay (days)	
3–5	3 (8.33%)
6–8	8 (22.22%)
9–10	16 (44.44%)
11–13	6 (16.67%)
14	3 (8.33%)

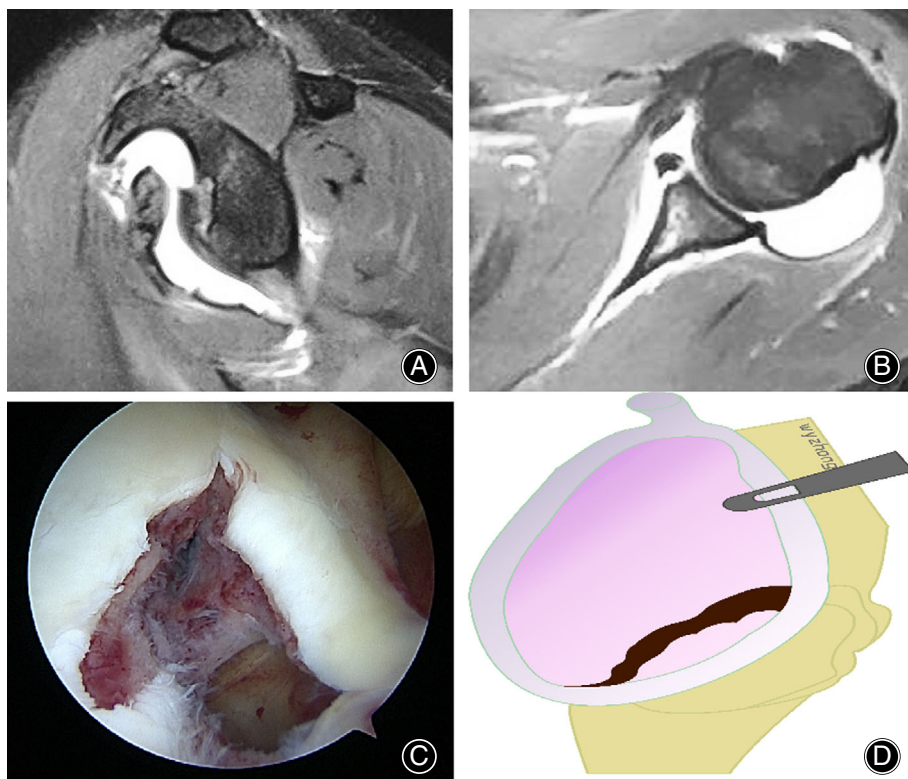


Fig. 1 Schematic diagram of the fracture. Preoperative schematic diagram of a 28-year-old male patient with scapular glenoid fractures (unless specified, the results of this study were from this typical case). (A, B) MRI scan of the left shoulder joint to assess the anterior and inferior scapular glenoid fractures; (C) arthroscopic anterior superior approach to observe the fracture (left shoulder); (D) anterior superior approach.

Surgical Approach

We established a standard posterior approach and performed routine arthroscopy. The anterior approach and the superior anterior approach were established (the rotation gap is close to the supraspinatus tendon), and the patient's scapular glenoid fracture and avulsion position, glenolabial injury, and humeral head injury were re-examined *via* the anterior superior approach (Figure 1C, D).

Bone Bed Cleaning and Surrounding Tissue Release of the Fracture Block under a Microscope

Arthroscopy observation was maintained through the anterior and upper approaches. The periosteal stripper and planer were placed in the anterior approach, the fracture surface was cleaned, the fracture blocks and the surrounding fascia and periosteum were loosened along the fracture surface, and finally, the direction of fracture reduction was evaluated.

Placement of the Inner Row Anchor

One double-loaded anchor 4 (Gryphon BR, Mitek, MO, USA) was implanted in the medial edge of the fracture at the neck of the scapula (Figure 2A) through the 5 o'clock approach.

Lead the Internal Row Anchor Line through the Tissue around the Fracture Blocks

A 45° left curved penetrating device (Spectrum, ConMed Linvatec, New York City, USA) was used to pass through the

joint capsule and glenoid labrum through the anterior approach and then grab the two tail threads of the same color on the anchor through the inner side of the bone block. The same operation was used to puncture and grab two other tail threads of the same color. The two punctures should be evenly distributed on the inner side of the fracture block, and the suture should be removed after use.

Placement of the External Row Anchor

Then, two to three anchors (Pushlock, Arthrex, Florida, USA) (Figure 2B) were implanted in the cartilage surface beside the edge of the glenoid fracture from low to high. Anchor 1 at 6 o'clock was used to reduce and lift the glenoid capsule tissue, and the fracture block was implanted with anchor 2 (Pushlock, Arthrex, Florida, USA) at the ideal reduction point (Figure 2C). A layout around the bone fragment was formed with two anchors screwed inside and outside, with the other two anchors screwed up and down (Figure 2D).

Fixation of the Fracture Block with the Double-Row and Double-Pulley Technique

The two tail threads of the same color of anchor 2 were taken and passed through the transparent working channel (CLEAR-TRAC 8.5 mm, Smith-nephew, Texas, USA) together with the two tail threads of the same color of anchor 4 (Gryphon BR, Mitek, MO, USA). Then, we knotted the two tails of different colors, cut the tail, and drew the remaining two tails of different colors. At the same time, the remaining two tail threads of different colors were pulled,

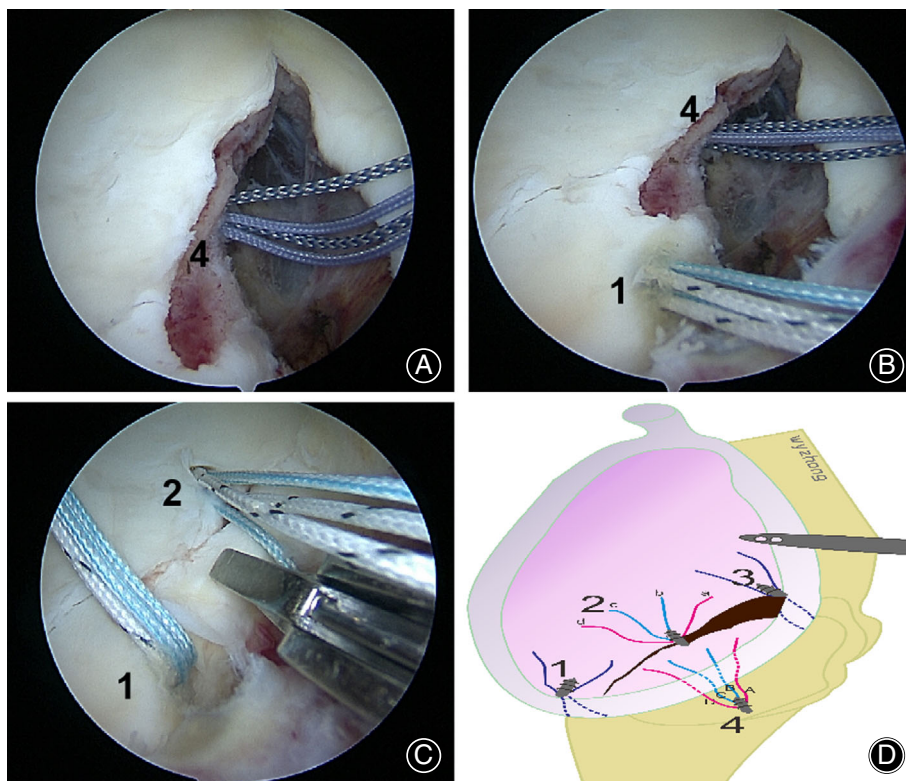


Fig. 2 Reduction and fixation of the scapular glenoid fracture block under a microscope. (A) Medial edge of the fracture of the scapular neck implanted through the subscapular muscle through the 5 o'clock approach. (B, C) The anchors 1, 2, and 3 were screwed close to the fracture edge and the corresponding reduction point of the fracture block on the cartilage surface of the scapula. (D) Schematic diagram of the positions of the anchors and the corresponding crossing lines.

and the suture sliding holes of the two anchors were used as “pulleys” to pull the knot into the joint and adjust the knot to the soft tissue side (Figure 3A). In the same way, the remaining sutures of the two anchors were again fixed with pulleys to complete the “double pulley” operation (Figure 3B).

Repair of the Glenoid Labrum and Surrounding Joint Capsule

The capsule was sutured above and below the fracture block with the tail lines of anchors 3 and 1 (Pushlock, Arthrex, Florida, USA) to enhance the stability of the fracture block (Figure 3C). The fracture was well-restored, and the labial integrity was restored under arthroscopy (Figure 3C, D). Figure 4 shows the final appearance of the double row and double pulley stitched and fixed.

Postoperative Care and Rehabilitation

After the operation, it is recommended that the patient starts to shrug actively and move the ipsilateral wrist and elbow. The forearm suspension strap was fixed for 4 weeks, during which passive abduction was $<90^\circ$ and external rotation was $<10^\circ$. The activity range gradually increased after 4 weeks, resistance exercise was introduced after 2 months, and a normal daily life was gradually restored after 6 months.

Postoperative Follow-Up and Evaluation

Three-dimensional (3D) reconstruction of shoulder joint CT was performed at 1 and 9 months postoperatively to assess fracture healing, the position of the fracture blocks and the orientation of the fixation materials. The patient's shoulder range of motion was recorded before and after treatment to determine whether there was any dislocation recurrence and the number of dislocations. All patients were evaluated with the Constant score, ASES score, and UCLA score to evaluate the function and stability of the shoulder joint before and after the operation. The higher the score, the better the shoulder function and stability of the patient. Moreover, we assessed the patient's shoulder abduction, flexion, and internal and external rotation activity through physical examination. The VAS assesses the patient's pain perception before and after the operation, with a total score of 10 points. The lower the score, the less pain.

Outcome Measures

The Visual Analog Scale (VAS) for Pain

The VAS is the most commonly used questionnaire for the quantification of pain. It is a continuous scale comprised of a horizontal or vertical line, usually 10 cm in length. For pain intensity, the scale is most commonly anchored by “no pain” (score of 0) and “pain as bad as it could be” (score of 10). A score of 0 is considered no pain, 1–3 is considered mild pain,

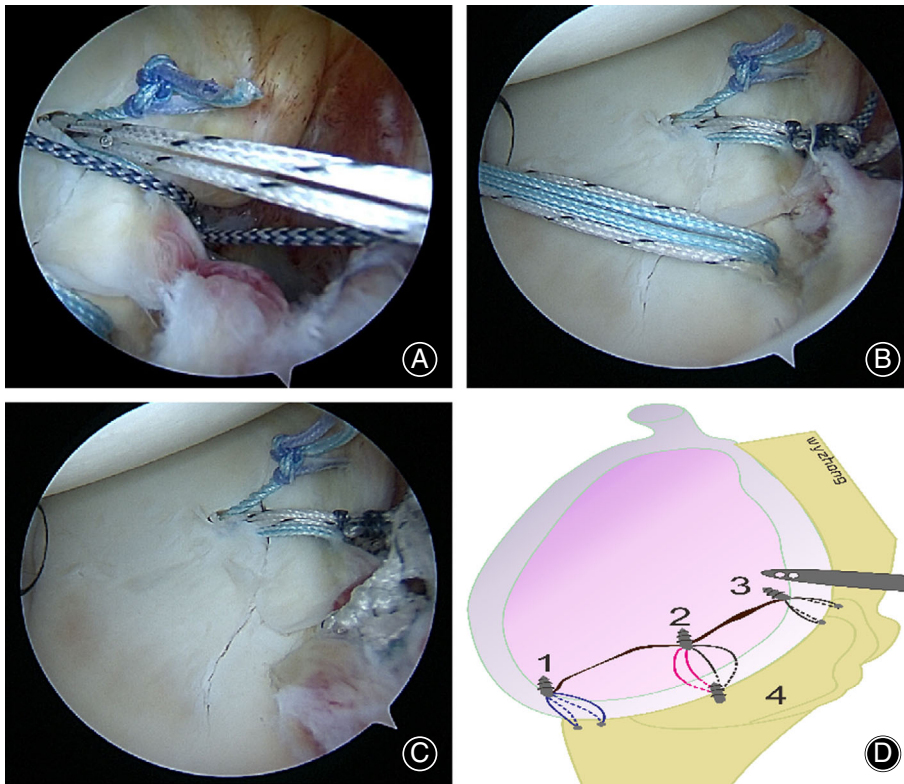


Fig. 3 Schematic diagram of fracture anchor position and suture knotting. (A, B) Anchor 2 and 4 nail double-row pulley suture fixation of the fracture; (C) anchor 1 and anchor 3 are sutured to tighten the glenoid lip tissue under and above the glenoid fracture, respectively. Observation of reduction of the scapular fracture through a posterior approach; (D) Double-row and double-pulley technique to fix the scapula. Schematic diagram of the fracture anchor position and suture knotting.

4–6 is considered moderate pain, and 7–10 is considered severe pain.

Constant Score

The Constant score is the most commonly used method for evaluating rotator cuff tears. The 100-point scoring scale takes into account both subjective and objective measurements: pain (0–15, with 0 being maximal pain and 15 being no pain); activities of daily living ($4 \times (0-5) = 0-20$, 0 worst and 5 best for each item); mobility ($4 \times (0-10) = 0-40$, active, pain-free range of elevation: +2 points per 30, where 0 is worst and 10 is best for each item); the position of the hand: 0 worst to 10 best); and strength (0–25, 1 point per 0.5 kg, maximum 25 points). A total score of 0 is the worst, and 100 is the best function.

American Shoulder and Elbow Surgeons (ASES) Score

The ASES score was developed by the American Shoulder and Elbow Surgeons Society, including a patient self-assessment section (patient ASES [pASES]) and a section completed by the examiner (clinical ASES [cASES]). The cASES section includes a physical examination and documentation of the range of motion, strength and instability, and demonstration of specific physical signs. No score is derived for this section. The pASES has 11 items that can be used to generate a score. These are divided into two areas: pain (one item) and function (10 items). The severity of pain is scored with a VAS.

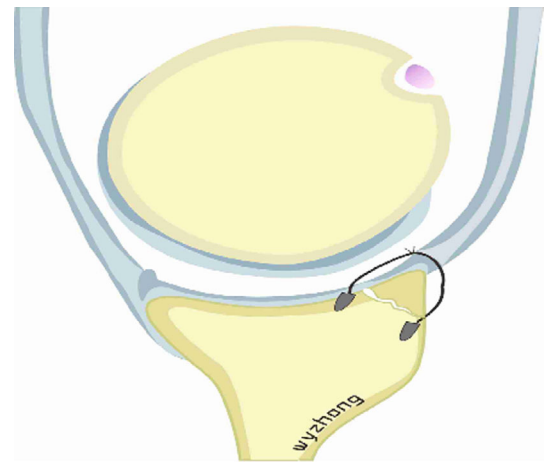


Fig. 4 Schematic diagram of the double-row and double-pulley reduction transverse position of the scapular fracture. Scapular glenoid Ideberg type Ia fracture. After the use of arthroscopy to reduce the fracture, two anchors are screwed into the upper and lower parts of the fracture, and the cross-section is fixed with double rows and double pulleys.

The University of California at Los Angeles Shoulder (UCLA) Joint Score

UCLA is the most commonly used shoulder joint function assessment method. The scoring system has 35 points,

including 10 points for pain, 10 points for function, five points for active flexion range, five points for flexion strength test, and five points for patient satisfaction. It can be divided into three levels: excellent (34–35), good (29–33), and poor (<29). Among them, pain, functional activity, and satisfaction are subjectively evaluated by patients, and the doctor's physical examination objectively evaluates forward flexion range and muscle strength.

Statistical Methods

SPSS 18.0 software (Chicago, IL, USA) was used for statistical analysis of the data. The measurement data following the normal distribution are represented by $\bar{x} \pm SD$. The comparison of the patients' system scores (VAS, UCLA, ASES, and Constant scores) before and after the operation was performed by Pearson χ^2 -tests and paired *t*-tests. $p < 0.05$ means that the difference between the comparison groups is statistically significant.

Results

General Results

A total of 36 cases were investigated. There were 25 men and 11 women. The age (mean \pm SD) was 40.1 ± 11.5 years old, range 21 to 66. Right/left shoulder joint: 28/8. The mean time from injury to surgery was 1 week (range, 4–8 days).

The surgical duration was 90–150 min with a mean of 127 min, and the average blood loss was 90 mL (range, 60–120 mL). The average total duration of hospital stay was 9.2 days (range, 3 to 14 days). The baseline characteristics of the patients are listed in Table 1.

Intraoperative Results

During the operation, the soft tissue and bone joints were fixed by the upper and lower anchor points. The inner and outer double rows used double pulleys to adjust and compress the bones perpendicular to the fracture line. By binding the fractures, the effect of fixing the fracture ends can be enhanced. Moreover, the joint capsule was repaired by suturing to increase the stability of the joint (Figure 4).

Fracture Healing

No case was lost to follow-up. All patients had achieved primary incision healing in both groups at the last follow-up. At the ninth month postoperatively, the 3D CT scan reconstruction results from all cases suggested that the fractures healed well, the fixation materials were located well, and the shoulder range of motion (including forward flexion, abduction, external rotation, and internal rotation) was almost normal (Figure 5).

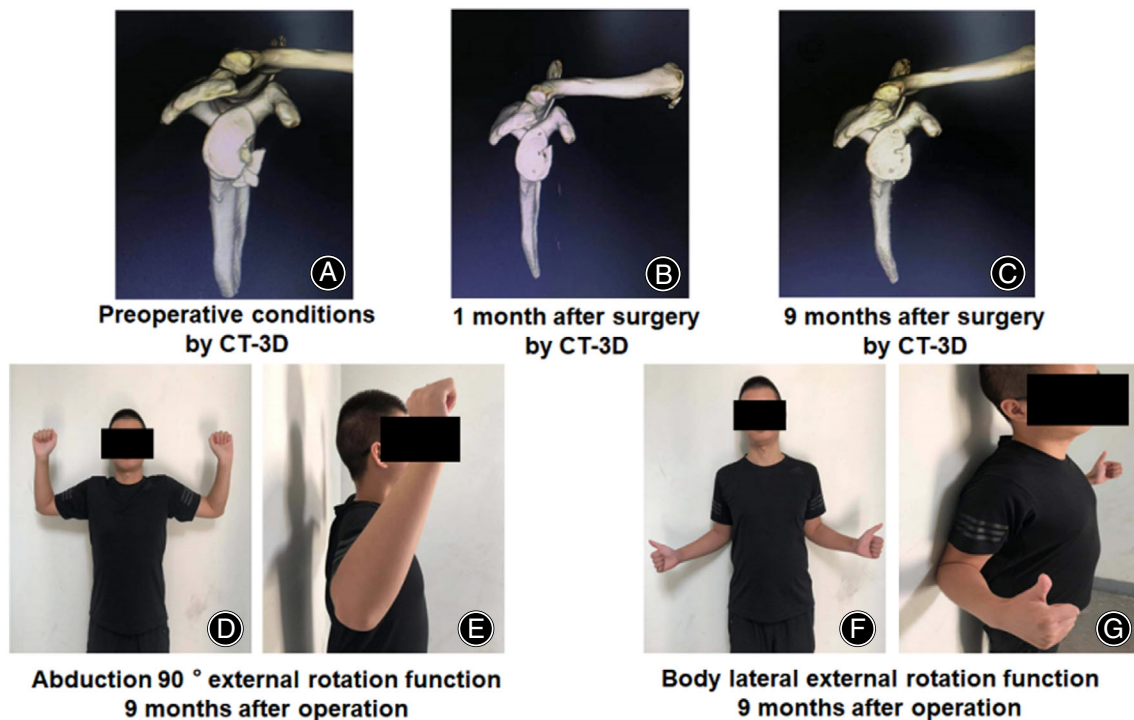


Fig. 5 Patient recovery results. (A) Preoperative CT showing the scapular glenoid fracture. (B) One month postoperatively, CT showing that the fracture reduction and fixation were good. (C) CT showing that the fracture healed well 9 months after surgery. (D–G) Physical examination at the final follow-up. Nine months postoperatively, abduction of 90° of external rotation function and body lateral external rotation function were well-recovered.

Shoulder Function Assessment

The Visual Analog Scale (VAS) for Pain

The preoperative VAS score was 7.55 ± 1.32 , and the postoperative VAS score was significantly reduced to 1.24 ± 0.72 at the final follow-up ($P < 0.05$, Table 2), which was 16.42% less than the preoperative VAS score.

Constant Score

Clinical assessment showed that the preoperative and postoperative Constant scores were 44.38 ± 2.16 and 93.52 ± 2.82 points, respectively, the latter being 2.11 times the former, with a significant difference ($P < 0.05$, Table 3).

American Shoulder and Elbow Surgeons (ASES) Score

Before surgical intervention, the mean ASES score of the patients was 43.47 ± 12.76 points. At the last follow-up after the operation, the mean ASES score was significantly improved to 91.34 ± 8.28 ($P < 0.05$, Table 2, Table 3), which was 2.10 times that before the operation.

The University of California at Los Angeles (UCLA) Shoulder Joint Score

UCLA shoulder joint score assessment showed that the preoperative and postoperative Constant scores were 21.80 ± 1.16 and 33.24 ± 1.64 points, respectively; the latter was 1.52 times the former, with a significant difference ($P < 0.05$, Tables 2 and 3).

Complications

In our study, only one patient experienced fat liquefaction, which was resolved following treatment with oral antibiotics.

No case with deep venous thrombosis or iatrogenic neurovascular compromise was identified. No cases of wound infection or neurovascular injury were observed. No patient experienced persistent shoulder pain, recurrence of dislocation, or range of shoulder movement reduction. Additionally, other major postoperative complications, such as fracture nonunion, pullout of the suture anchor, and screw penetration, were not observed in the current study.

Discussion

The scapula, the joint capsule, and the surrounding ligaments and muscles constitute the stable compound structure of the shoulder joint. When the structure is damaged, it causes the shoulder joint to become unstable. Ideberg type Ia glenoid fractures and osseous Bankart injuries have been proposed in different areas of expertise, and they are basically the same injury, except that the former emphasizes bony injuries, and the latter focuses more on soft tissue injuries. Therefore, studying how to treat glenoid fractures and fully restore shoulder joint function is meaningful.

Surgical Outcomes of the Double-Row and Double-Pulley Techniques

Arthroscopic treatment of scapular fractures has gradually been accepted and used clinically. Some data indicate that compared to ORIF, arthroscopic surgery for the shoulder joint has minor trauma, which is conducive to early postoperative functional exercise and significantly reduces the risk of postoperative stiffness and infection.^{20,21} In addition, the use of arthroscopic suture anchors for scapular glenoid fractures has an excellent fixation effect²² and a low recurrence rate of postoperative dislocation.¹⁷ It has also achieved good

Table 2 Comparison of VAS, UCLA, and ASES scores before and after surgery ($\bar{x} \pm s$, points) ($n = 36$)

Parameter	Preoperative	4 weeks after surgery	12 months after surgery
VAS score	7.55 ± 1.32	2.28 ± 1.26 *	1.24 ± 0.72 **
UCLA score	21.80 ± 1.16	25.40 ± 1.28 *	33.24 ± 1.64 **
ASES score	43.47 ± 12.76	63.24 ± 10.23 *	91.24 ± 8.28 **

VAS: Visual Analog scale; ASES: American Shoulder and Elbow Surgeons scale; UCLA: University of California at Los Angeles scale. The values are the means \pm SD, $n = 36$. * $p < 0.05$, 4 weeks after surgery or 12 months after surgery vs preoperative. ** $p < 0.05$, 12 months after surgery vs 4 weeks after surgery

Table 3 Comparison of constant scores before and after surgery ($\bar{x} \pm s$, points)

Parameter	Preoperative	4 weeks after surgery	12 months after surgery
Power	21.05 ± 1.38	22.24 ± 1.56 *	23.15 ± 1.28 **
Shoulder joint range of motion	12.06 ± 2.05	22.08 ± 2.45 *	28.38 ± 2.64 **
Daily activities	10.15 ± 1.05	14.21 ± 1.28 *	16.24 ± 1.42 **
Total score	44.38 ± 2.16	61.48 ± 2.58 *	93.52 ± 2.82 **

The values are the means \pm SD, $n = 36$. * $p < 0.05$, 4 weeks after surgery or 12 months after surgery vs preoperative. ** $p < 0.05$, 12 months after surgery vs 4 weeks after surgery

results in treating chronic scapular glenoid fractures and large bone block defects in the glenoid.²³

Sugaya *et al.*²⁴ sutured through the bone block using four anchors. As a result, 35 of 37 patients could return to motion, and the external rotation angle of 0° on the side and 90° of abduction could be restored to 75° and 93°, respectively. However, this method requires a particular puncture device, and fracture fragments often occur during surgery. The fracture block and the bone bed are in point contact under a single suture anchor fixation, so the initial stability and contact area are not ideal.

Spiegl *et al.*²⁵ performed single-row and double-row fixation surgery on 28 fractures of shoulder joint specimens with a fractured block more significant than 25% of the glenoid area, and the biomechanical tests showed that double-row fixation had better initial stability and a better reduction effect than single-row fixation. Phob *et al.*²⁶ introduced a double-row fixation technique similar to the one used in this article, but it lacked anchors perpendicular to the fracture line, affecting the fixation strength and reduction accuracy. In this study, the use of the double-row and double-pulley technique improved on these limitations.

Our follow-up results showed that 4 weeks after the operation, the range of shoulder joint motion and functional scores were significantly improved compared with those before the operation, and the pain was significantly reduced. One month after the operation, the CT examination showed no obvious displacement of the fracture block, and the position of the internal fixation nail was fixed satisfactorily. Nine months postoperatively, the CT results demonstrated that the fractures were healed, and the function of the left shoulder joint was basically restored. One year after the operation, the functional scores of the shoulder joint had returned to near-normal. These results demonstrated that the double-row and double-pulley technique for fixation of scapular glenoid fractures could obtain good reduction and fixation strength, and no strict immobilization is required after the operation, which can effectively reduce the degree of postoperative joint stiffness and pain.

The Technical Characteristics of the Double-Row and Double-Pulley Technique in the Treatment of Scapular Glenoid Fractures

The previously reported double-row fixation technique first inserts a threaded anchor in the inner row and then passes the two tail wires through the joint capsule at different points and finally uses two Pushlock squeeze nails to separate the two in the inner row. The sutures are squeezed and fixed on the surface of the anterior scapular glenoid bone block, and two Pushlock squeeze nails form a triangular distribution of the two sutures.²⁷ This fixation approach makes the pressure of the scapular glenoid bone block on the glenoid section more uniform, which is more conducive to fracture healing. However, if any suture is loosened, the side of the fracture block will lose its contact pressure on the fractured section.

The double-row and double-pulley technique we introduced in this study has at least two sets of loop fixing systems in different directions, and each loop fixing system is comprised of two separate loops. These four loops do not cross each other and are evenly distributed on the surface of the small bone blocks. Therefore, the contact pressure between the small bone blocks and the lateral scapular glenoid section is evenly distributed, and there will be no pressure concentration. Even if one of the sutures becomes loose, the remaining sutures can still effectively fix the bone. In addition, the double-row and double-pulley technique fixes scapular glenoid fractures, binding the bone blocks without passing through the blocks regardless of whether they are large or small. The puncture site of this technique is at the junction of the tendon and bone. The joint capsule ligament and bone block are tied together and tightened. The two upper and lower anchors hold the joint of the soft tissue and bone block, and the inner and outer double rows use double pulleys to adjust and pressurize the bone block perpendicular to the fracture line, which overcomes the shortcomings of traditional point-like contact and does not require bone penetration, avoiding the possibility of fracture. In addition, an anchor is placed inside, which simplifies the operation process.

Limitations

There were some limitations of this study. We did not quantify the glenoid fractures before the operation, and there is no relevant instrument to check the mechanics after fracture reduction and fixation before and after surgery. However, we evaluated postoperative shoulder joint function using various shoulder joint function scores. The difficulty of arthroscopic suturing and the long learning curve are disadvantages of this technique. Moreover, the operation of shoulder arthroscopy is complicated and involves the establishment of working channels, the proficiency of arthroscopy operation techniques and the suitability of surgical instruments. These factors will affect the postoperative efficacy.²⁸

Conclusion

In summary, the double-row and double-pulley technique under shoulder arthroscopy treats scapular glenoid Ideberg Ia fracture by restoring the soft tissue tension around the fracture block and increasing the fixation strength of the fracture block to maximize fracture healing. It has the advantages of minor trauma, accurate reduction, and firm fixation. It restores the function of the shoulder joint, and the effect is satisfactory.

Acknowledgement

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Conflict of Interest

The authors declared that they have no conflict of interest.

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