

## Complications of rotator cuff repair

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**Rotator cuff repair provides pain relief and improved function. Arthroscopic rotator cuff repair has been the gold standard during the last decade and the results are comparable with open repair. Various techniques have been reported for both methods. However, the potential complications following rotator cuff repair are not well documented. This review describes complications after rotator cuff repair and reviews the management.**

**Key words: Rotator cuff - Postoperative complications - Shoulder.**

Rotator cuff disease is a common cause of shoulder pain and dysfunction.<sup>1</sup> The prevalence of rotator cuff tears in the general population has been found in cadaver and MRI studies to range from 5% to 39%.<sup>2</sup> Surgical repair of the rotator cuff repair has proven to be an effective treatment option with good to excellent short-term and mid-term results in both functional improvement and pain relief.<sup>1, 3, 4</sup>

Arthroscopy treatment for rotator cuff tear has gained popularity over the last decade. With technologic improvements, arthroscopic evaluation of the shoulder magnified the view of rotator cuff anatomy and understanding of the pathology. Since 1990, the sports medicine and arthroscopy literature has introduced papers documenting the short- and

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long-term success of these techniques comparable with the literature for miniopen and traditional repairs.<sup>5-7</sup>

Authors have noted the difficulty of accurately assessing complication rates after rotator cuff repair secondary to under-reporting.<sup>8, 9</sup> An overall complication rate of shoulder arthroscopy of 5% to 9.5% has been reported.<sup>10</sup> Complications of rotator cuff have not studied extensively.<sup>11</sup> In one review of open rotator cuff repair the complications rate was 10.5%.<sup>12</sup> Similarly in another retrospective review of arthroscopic rotator cuff repair the complications rate was also 10.6%.<sup>13</sup>

Complications can be divided as medical and surgical complications.

### Medical complications

These occur early following the surgical procedure. Urinary tract, pulmonary, gastric and cardiac complications have been reported.<sup>12</sup> Older age and number of comorbidities are considered as main risk factors for these complications. A careful history, including a review of the medical record and operative notes should allow the possible medical

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complications to be identified and improve the likelihood to be eliminated.

### Surgical complications

Surgical complications may be related to arthroscopic shoulder surgery or specific to rotator cuff repair. The surgical complications after rotator cuff repair are defined as "early" when they occur within 6 weeks of surgery and as "late" when they develop more than 6 weeks following surgery. Surgical complications also can be categorized as "major" when they affect the final result and additional treatment is required and "minor" when they do not affect the final result.

Infection has been reported to occur after shoulder arthroscopy with rates from 0.23 to 3.4%.<sup>10</sup> In one study of 116 open rotator cuff repairs 1.7% deep wound infections were reported.<sup>12</sup> In contrast with arthroscopic technique the rate of infection has been reported to be 0.38%.<sup>13</sup> Awareness of this potential problem is critical as postoperative infection may be subtle and often delayed until the end of the first month. The laboratory and imaging studies are often unrevealing. Systemic symptoms may be absent, but the patient may have local erythema and wound drainage. When infection is suspected bursal or joint aspiration and wound debridement is required in addition to antibiotic therapy.

Complications related to general anesthesia have been reported though with low frequency. Airway obstruction from extravasation of fluid into the mediastinum,<sup>14</sup> epinephrine induced arrhythmia, pulmonary edema, pneumothorax have all been reported.<sup>15-17</sup> Also neurologic injuries related to regional anesthesia have occurred.<sup>18</sup> Meticulous preoperative planning and knowledge of the anatomy should eliminate these complications.

#### *Complications related to shoulder arthroscopy*

Vascular injuries after shoulder arthroscopy are rare. However injury of the cephalic vein, pseudoaneurysm of the axillary artery caused by interscalene block, and deep venous

thrombosis (DVT) have been reported.<sup>10, 19, 20</sup> Careful attention to positioning, fluid management and appreciation of shoulder anatomy to select portal placement will help decrease the vascular complications. The need for pharmacologic prophylaxis for DVT is controversial as literature provides no data to support it.<sup>21</sup> However, prophylaxis might be a prudent option in a patient at high risk such previous DVT or with a vascular history or previous surgery in the area which has changed the anatomy.

The main concern after shoulder arthroscopy regarding the complications remains the neurologic injuries. Most of them are neuropraxias. These can be caused by the positioning of the patient, by establishment the portals or interscalene block. The reported rate of neurapraxia has ranged from 0 to 30%.<sup>22</sup> These injuries have involved the musculocutaneous nerve, ulnar nerve, radial nerve, axillary nerve, and median nerve with the musculocutaneous to be at greater risk.<sup>22</sup> Traction has also been a cause of transient neurologic injury when the lateral position is used.<sup>24</sup> Hypoglossal - nerve palsy has been reported when the beach - chair position is used.<sup>22</sup> It has been postulated a change in the position of the neck during the procedure causes pressure in the hypoglossal nerve and neuropraxia. A thorough knowledge of the anatomy and proper positioning of the patient will reduce the risk for neurologic injury.

Excessive swelling with resulting skin necrosis due to fluid extravasation has been reported.<sup>18</sup> Caution should be given to intraoperative swelling especially with the use of a pump so this possible complication can be diagnosed early.

Iatrogenic injury — intraosseous damage of humeral head or tendon injury — associated with the portal placement has also been reported.<sup>10</sup> Appropriate arm positioning and portal placement is mandatory to avoid these problems.

#### *Complications related with rotator cuff repair*

These can be divided into intraoperative, postoperative, and major or minor compli-

TABLE I.—*Complications after rotator cuff repair.*

<i>Medical</i> — Urinary, pulmonary, gastric tract, cardiac	<i>Management</i> — Clinical evaluation, review medical record, proper patient selection
<i>Related to shoulder arthroscopy</i> — Infection, neurologic - vascular injury, chondral - tendon injury, fluid extravasation	<i>Management</i> — Meticulous preoperative clinical examination Knowledge of the anatomy, optimal surgical technique
<i>Related to rotator cuff repair</i> — Heterotopic ossification, stiffness-frozen shoulder, failure of the repair	<i>Management</i> — Meticulous preoperative clinical examination, review of the medical record, review of the imaging studies, optimal surgical technique, appropriate rehabilitation

complications. Major complications are defined as those events that required additional operation or reoperation resulted in prolonged temporary or permanent disability. Minor complications are defined as those cases that do not require any further surgery, but may require additional therapy or extended observations.

Major intraoperative complications include fracture of the acromion, detachment of deltoid, denervation, and iatrogenic injury of the coracoacromial arch. Inadequate operation can also be included among major intraoperative complications. Inadequate operation may be a missed lesion of the biceps tendon or the labrum or both, a missed acromioclavicular arthropathy, or inadequate acromioplasty. All these issues will compromise the final result. Inadequate acromioplasty has been reported by many authors as the common source for failure after rotator cuff repair.<sup>25</sup> Other authors reported that subacromial decompression is required only in bursal side tears.<sup>26</sup> On the contrary, other studies found that the acromioplasty does not affect the final outcome of cuff repair.<sup>27</sup> Additionally, removal of an excessive amount of the acromion may be associated with fracture of the acromion or deltoid injury. Meticulous acromioplasty with palpation and visualization of the anterior and lateral portion of the acromion is mandatory to avoid this problem. An intraoperative fracture should be identified at the time of operation and should be corrected to prevent a painful non-union. Another potential complication

during cuff repair is the iatrogenic injury of the coracoacromial ligament which provides anterosuperior stability for the humeral head.<sup>25</sup> Appropriate acromioplasty has been described by many authors either arthroscopically or with open technique with similar results.<sup>28, 29</sup>

Nerve injuries are reported to occur in 1% to 2% of patients undergoing rotator cuff surgery.<sup>23</sup> The main neurologic injury of rotator cuff repair is the denervation of the deltoid.<sup>25</sup> The anterior branch of the axillary nerve runs 5 cm inferior to the lateral and anterior margin of the acromion perpendicular to the direction of the muscle fibers. Dissection of the deltoid beyond this distance should be avoided and three-dimensional knowledge of nerve anatomy is essential during arthroscopy for safe portal placement and trochar dissection. Nerve injuries that do occur should be observed with delayed electrodiagnostic testing should nerve recovery not occur within a 3 to 6 week period.

#### *Postoperative complications*

These are infection, heterotopic ossification, stiffness - frozen shoulder, and recurrent tearing. Infection has been discussed separately as it may be related with any shoulder arthroscopy. Heterotopic ossification occurs with rates 3% to 5% mostly after acromioplasty.<sup>25</sup> It can be formed in the subacromial space and can compromise the outcome but may be asymptomatic. Lesions that

affect motion should be excised. Meticulous removal of all bone fragments reduces the chance of heterotopic bone formation. Low dose irradiation in 48 h or indocin given orally has been used in preventing recurrence.<sup>25</sup>

Postoperative stiffness remains one of the main source of functional limitation after rotator cuff repair<sup>10</sup> and has been reported with rates from 2.7% to 15%.<sup>13</sup> Other authors using strict criteria for the diagnosis of stiffness have reported a rate 8.7% after arthroscopic rotator cuff repair.<sup>13</sup> Postoperative stiffness may be linked to an intense inflammatory response.<sup>12</sup> Preoperative motion loss may identify the at-risk patients. Preoperative restriction of range of motion with the hand behind the back has been associated with postoperative stiffness.<sup>30</sup> In some patients adhesions, capsular contracture, or scarring in the classic frozen shoulder have been postulated to be associated with postoperative stiffness.<sup>25</sup> Adhesion capsulitis has been associated with female gender, worker's compensation, and suboptimal recovery.<sup>25, 31, 32</sup> Meticulous preoperative clinical examination of the patient and early motion from the first postoperative day may reduce the prevalence of this complication.

The major complication after rotator cuff repair is the failure of repair which has been reported with higher rate 3.5%.<sup>10</sup> The functional outcome is generally better if the repaired tendons heal.<sup>33</sup> The cause of the failed rotator cuff repair is multifactorial. Suboptimal technique, intensive physical therapy, hardware failure (anchors, knots, sutures), diabetes, previous operation, smoking, age, inflammatory rheumatoid disease, chronic tear, postoperative medications (NSAIDs, steroids), and advanced fatty infiltration of the affected muscle are considered as factors for nonhealing.<sup>9, 10, 34-38</sup> Moreover, age, in-patient, female gender, worker's compensation, and comorbidities have been associated with reoperation within one year after cuff repair.<sup>11</sup> Surgical and rehabilitation methods should be aimed to maximize the probability of tendon healing.

Rotator cuff repair is an effective treatment improving function and reducing pain resulting from cuff pathology. All arthroscopic

repair is becoming the gold standard with excellent outcomes comparable with mini-open repair.<sup>39</sup> However, there are many potential complications that may impair the outcome (Table I). Meticulous clinical evaluation with careful history, review of the medical record and imaging studies, correct diagnosis and appropriate rehabilitation are modalities help eliminate these complications.

### Riassunto

#### *Complicanze della riparazione della cuffia dei rotatori*

La riparazione della cuffia dei rotatori permette di ridurre il dolore e migliorare la funzionalità. Nell'ultima decade la riparazione artroscopica è diventata il gold standard del trattamento e i risultati sono comparabili a quelli ottenuti con la riparazione a cielo aperto. Sono state descritte diverse tecniche per entrambe le metodiche. Tuttavia le potenziali complicanze associate alla riparazione della cuffia dei rotatori non sono ben documentate. Questa review descrive le complicanze della riparazione della cuffia dei rotatori e ne analizza la gestione.

Parole chiave: Cuffia dei rotatori - Complicanze postoperatorie - Spalla.

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