

Distal Clavicle Excision (Mumford Procedure)

Overview

- A well-performed distal clavicle excision will likely perform better than a poorly performed one, regardless of whether an open or arthroscopic approach is chosen [1].
- Patients undergoing arthroscopic distal clavicle excision through the direct approach can expect a faster return to activities compared with the open procedure while obtaining similar long-term outcomes [2].
- Arthroscopic distal clavicle resection has provided more ‘good or excellent’ results than has the open procedure, though this finding is comprised of low-level evidence [3].
- Simple excision of the outer end of the clavicle has yielded satisfactory results with no residual upward displacement disturbing patients [4].
- Patients with displacement greater than 100% of the thickness of the distal clavicle had poorer postoperative clinical outcomes [5].
- Incomplete excision and regrowth of the distal clavicle are the most common causes of revision surgery [6].
- Portal placement remains paramount in facilitating surgery and avoiding injury to adjacent extra-articular structures regardless of the technique chosen for distal clavicle resection [7].
- In appropriately selected patients, open or arthroscopic distal clavicle resection is necessary to relieve symptoms [8].
- Distal clavicle excision with 2.5 mm of bone was successful in many specimens, but a 5 mm resection guaranteed no bone-to-bone abutment [9].
- Arthroscopic and open distal clavicle excisions both provide significant pain reduction at 1 year with no significant difference in outcome measures between groups, except for VAS pain score improvement [10].
- Excision of the outer end of the clavicle is preferred for old dislocations, while open reduction and internal fixation are not recommended due to complications and poor functional results [15].
- Both the direct superior approach and the indirect subacromial approach to the arthroscopic distal clavicle resection result in successful clinical outcome with clinically insignificant difference at final follow-up [16].

Anatomy & Pathophysiology

- A precise, easy to use and low-cost non-invasive method able to draw and analyze the kinematics of the shoulder complex has not been developed yet [25].
- Normative kinematic values of scapulothoracic movements in the shoulder girdle have been provided [26].
- No reconstruction strategy completely restores the shoulder girdle to its preinjured state, although each technique restores different elements of joint kinematics [27].
- The trapezoid and conoid ligaments have unique functions in normal shoulder kinematics because of their anatomic attachments [28].
- Kinematic changes could be a potential source of pain and dysfunction in the shoulder with AC joint dislocation [29].
- Scapular and clavicular kinematics were affected in AC separation models [30].
- A comprehensive clinical approach emphasizing the evaluation of the extent of the anatomic injury and understanding its mechanical consequences regarding shoulder and arm function is key in the development of guidelines for developing operative or non-operative treatment protocols and for establishing outcomes of the treatment protocols [31].
- The inconsistency of AC joint testing parameters and the lack of thorough translation studies indicate a necessity for increased attention in the overall assessment of shoulder stability to close the gap in the foundational biomechanical research [32].
- Anatomically, the pectoralis minor tendon provides sufficient tissue length, excursion, and width [33].
- Biomechanically, the pectoralis minor tendon is as strong as the coracoacromial ligament [33].
- No significant biomechanical differences in displacement or stiffness were seen between the anatomical landmark technique and the coracoid-based landmarks technique for coracoclavicular stabilization [34].
- New surgical techniques continue to evolve as more biomechanical data emerge and kinematic understanding improves [35].
- Emerging concepts and strategies regarding horizontal and rotational instability and scapular biomechanics aim to lay the foundation for future studies aimed at improving treatment outcomes and patient management [36].
- Preliminary findings revealed no detectable differences between surgically reconstructed and uninjured sides in ACJ biomechanics, range of motion, and isometric strength [37].
- Nonoperatively treated shoulders showed increased internal rotation, upward rotation, and posterior tilting [37].
- Type I and II acromioclavicular joint disruptions impair long-term shoulder function in about half of patients 10 years after injury [40].
- At 150 to 200 N of loading, coracoacromial ligament excision and acromioplasty increase the rotator cuff force required to maintain normal glenohumeral biomechanics by 25% to 30% [41].
- Centre of pressure measurement detected sensorimotor functional deficits following surgical treatment of the shoulder joint in patients with confirmed successful clinical and functional outcomes [42].

Classification

- A well-performed distal clavicle excision will likely perform better than a poorly performed one, regardless of whether an open or arthroscopic approach is chosen [1].
- Patients undergoing an arthroscopic procedure specifically through the direct approach can expect a faster return to activities while obtaining similar long-term outcomes compared with the open procedure [2].
- Arthroscopic distal clavicle resection has provided more 'good or excellent' results than has the open procedure, but this finding is comprised of low-level evidence [3].
- Simple excision of the outer end of the clavicle has yielded satisfactory results with no residual upward displacement disturbing the patients [4].
- Patients with displacement greater than 100% of the thickness of the distal clavicle had poorer postoperative clinical outcomes [5].
- Incomplete excision and regrowth of the distal clavicle are the most common causes of revision [6].
- Portal placement remains paramount in both facilitating surgery and avoiding injury to adjacent extra-articular structures regardless of the technique chosen for distal clavicle resection [7].
- In appropriately selected patients, open or arthroscopic distal clavicle resection is necessary to relieve symptoms [8].
- Distal clavicle excision with 2.5 mm of bone was successful in many specimens, but a 5 mm resection guaranteed no bone-to-bone abutment [9].
- Arthroscopic and open distal clavicle excisions both provide significant pain reduction at 1 year with no significant difference in outcome measures between groups, except for VAS pain score improvement [10].
- Horizontal instability of the clavicle is evident with distal clavicle resection of greater than 10 mm [11].
- The new operative procedure combines resection arthroplasty with fixation of the clavicle in an anatomical position [12].
- A records review found that 10 of 894 (1.1%) rotator cuff repairs underwent subsequent distal clavicle resection [23].
- The cross-sectional A-frame morphology of the superior cortex of the distal clavicle provides a reproducible landmark that is eliminated approximately 1.0 cm medial to the distal, lateral end of the clavicle, which can be used intraoperatively to determine when adequate resection has been completed [24].
- Severe chronic symptomatic AC joint separations (Rockwood types III through V) can be repaired entirely by arthroscopy safely and effectively by transferring the coracoacromial ligament with a bone block in the distal clavicle [47].

Clinical Presentation

- A well-performed distal clavicle excision will likely perform better than a poorly performed one, regardless of whether an open or arthroscopic approach is chosen [1].

- Patients having an arthroscopic procedure, specifically through the direct approach, can expect a faster return to activities while obtaining similar long-term outcomes compared with the open procedure [2].
- Arthroscopic distal clavicle resection has provided more ‘good or excellent’ results than has the open procedure, but is comprised of low-level evidence [3].
- Simple excision of the outer end of the clavicle has yielded satisfactory results in patients with complete dislocation and subluxation of the acromioclavicular joint, with no residual upward displacement disturbing the patients [4].
- Patients with displacement greater than 100% of the thickness of the distal clavicle had poorer postoperative clinical outcomes [5].
- Incomplete excision and regrowth of the distal clavicle are the most common causes of revision surgery [6].
- Portal placement remains paramount in both facilitating surgery and avoiding injury to adjacent extra-articular structures regardless of the technique chosen for distal clavicle resection [7].
- In appropriately selected patients, open or arthroscopic distal clavicle resection is necessary to relieve symptoms [8].
- Although distal clavicle excision with 2.5 mm of bone was successful in many specimens, a 5 mm resection guaranteed no bone-to-bone abutment [9].
- Arthroscopic and open distal clavicle excisions both provide significant pain reduction at 1 year with no significant difference in outcome measures between groups, except for VAS pain score improvement [10].
- Horizontal instability of the clavicle is evident with distal clavicle resection of greater than 10 mm [11].
- Late loss of reduction was common, and clavicular resection reliably produced significant improvement in patients with persistent pain or posttraumatic arthritis [13].
- In carefully selected patients with isolated ACJ pathology, arthroscopic distal clavicle excision results in statistically and clinically significant improvements in range of motion and patient-reported outcome measures [14].
- Excision of the outer end of the clavicle is preferred for old dislocations, while open reduction and internal fixation are not recommended due to complications and poor functional results [15].
- Methods to diagnose both superior and posterior translation of the clavicle need further debate [17].
- Clinical examination and surgical treatment should address anatomic restoration of individual structures to optimize the mechanical capability of the claviscapular segment [18].
- For chronic symptomatic injuries, partial claviclectomy is believed to be the best procedure, offering negligible morbidity and rapid return to function [19].
- Operation should be considered only in thin patients with a prominent clavicle, those doing heavy work, or those whose work requires frequent shoulder abduction and flexion [20].
- Older patients and females were more likely to experience postoperative complications requiring reoperations, including revision ACJR, distal clavicle excision, and irrigation and debridement [21].
- Excellent clinical results were achieved with acromioclavicular joint reconstruction with coracoacromial ligament transfer using the docking technique, decreasing the risk of recurrent distal clavicle instability [46].

Investigations

- A well-performed distal clavicle excision will likely perform better than a poorly performed one, regardless of whether an open or arthroscopic approach is chosen [1].
- Patients having an arthroscopic procedure, specifically through the direct approach, can expect a faster return to activities while obtaining similar long-term outcomes compared with the open procedure [2].
- Arthroscopic distal clavicle resection has provided more 'good or excellent' results than has the open procedure, but is comprised of low-level evidence [3].
- Simple excision of the outer end of the clavicle has yielded satisfactory results in this group of patients, with no residual upward displacement disturbing the patients [4].
- Patients with displacement greater than 100% of the thickness of the distal clavicle had poorer postoperative clinical outcomes [5].
- Incomplete excision and regrowth of the distal clavicle are the most common causes of revision [6].
- Portal placement remains paramount in both facilitating surgery and avoiding injury to adjacent extra-articular structures regardless of the technique chosen for distal clavicle resection [7].
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- Distal clavicle excision with 2.5 mm of bone was successful in many specimens, but a 5 mm resection guaranteed no bone-to-bone abutment [9].
- Horizontal instability of the clavicle is evident with distal clavicle resection of greater than 10 mm [11].
- The new operative procedure combines resection arthroplasty with fixation of the clavicle in an anatomical position [12].
- In carefully selected patients with isolated ACJ pathology, arthroscopic distal clavicle excision results in statistically and clinically significant improvements in range of motion and patient-reported outcome measures [14].
- Methods to diagnose both superior and posterior translation of the clavicle need further debate [17].
- Clinical examination and surgical treatment should address anatomic restoration of individual structures to optimize the mechanical capability of the claviscapular segment [18].
- A 5-mm distal clavicle resection guaranteed no abutment but decreased joint stiffness [22].
- The cross-sectional A-frame morphology of the superior cortex of the distal clavicle provides a reproducible landmark that is eliminated approximately 1.0 cm medial to the distal, lateral end of the clavicle, which can be used intraoperatively to determine when adequate resection has been completed [24].
- Weighted stress radiographs significantly increased the measured elevation of the clavicle and the coracoclavicular distance compared to non-weighted views [54].
- There was no significant difference between open or arthroscopic distal clavicle excision (DCE) [55].
- Although radiological assessment showed a statistically significant immediate superior clavicular displacement after hardware removal following ACJ stabilization, with an increased incidence in the first

year following stabilization, this may not negatively influence the results of ACJ stabilization in a clinically relevant way [56].

- Fifteen years postoperatively, good clinical results persisted and anatomic reduction was overall maintained, often with asymptomatic ossification of the coracoclavicular ligaments [57].

Treatment

- A well-performed distal clavicle excision will likely perform better than a poorly performed one, regardless of whether an open or arthroscopic approach is chosen [1].
- Patients undergoing arthroscopic distal clavicle excision via the direct approach can expect a faster return to activities compared with the open procedure while obtaining similar long-term outcomes [2].
- Arthroscopic distal clavicle resection has provided more ‘good or excellent’ results than the open procedure, though this is based on low-level evidence [3].
- Simple excision of the outer end of the clavicle has yielded satisfactory results with no residual upward displacement disturbing patients [4].
- Patients with displacement greater than 100% of the thickness of the distal clavicle had poorer postoperative clinical outcomes [5].
- Incomplete excision and regrowth of the distal clavicle are the most common causes of revision surgery [6].
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- Distal clavicle excision with 2.5 mm of bone was successful in many specimens, but a 5 mm resection guaranteed no bone-to-bone abutment [9].
- Arthroscopic and open distal clavicle excisions both provide significant pain reduction at 1 year with no significant difference in outcome measures between groups, except for VAS pain score improvement [10].
- Horizontal instability of the clavicle is evident with distal clavicle resection of greater than 10 mm [11].
- Late loss of reduction was common, and clavicular resection reliably produced significant improvement in patients with persistent pain or posttraumatic arthritis [13].
- Excision of the outer end of the clavicle is preferred for old dislocations, while open reduction and internal fixation are not recommended due to complications and poor functional results [15].
- Both the direct superior approach and the indirect subacromial approach to arthroscopic distal clavicle resection result in successful clinical outcomes with clinically insignificant difference at final follow-up [16].
- A 5-mm distal clavicle resection guaranteed no abutment but decreased joint stiffness [22].
- Surgical treatment may offer early benefits in pain relief and coracoclavicular distance improvement but does not enhance long-term functional outcomes and is associated with higher specific complication rates [49].

- The slight increase in the in situ graft force only in the posterosuperior and posterior direction after distal clavicle excision suggests only a marginal protective role of the acromioclavicular articulation [50].
- A bone anchor system for distal fixation in the base of the coracoid process and a medialized hole in the clavicle restored anatomy best [52].

Complications

- A well-performed distal clavicle excision performs better than a poorly performed one, regardless of whether an open or arthroscopic approach is chosen [1].
- Incomplete excision and regrowth of the distal clavicle are the most common causes of revision surgery [6].
- Portal placement is paramount in facilitating surgery and avoiding injury to adjacent extra-articular structures [7].
- Distal clavicle excision with 2.5 mm of bone was successful in many specimens, but a 5 mm resection guaranteed no bone-to-bone abutment [9].
- Horizontal instability of the clavicle is evident with distal clavicle resection of greater than 10 mm [11].
- Patients with displacement greater than 100% of the thickness of the distal clavicle had poorer postoperative clinical outcomes [5].
- Older patients and females were more likely to experience postoperative complications requiring reoperations, including revision ACJR, distal clavicle excision, and irrigation and debridement [21].
- The incidence of complications in operative acromioclavicular joint separations in an active population was 1.35 per 100 person-years [59].
- Clavicle and coracoid fractures occurred in 1.9 out of 100 cases of operative acromioclavicular joint separations [59].
- Fracture of the distal clavicle or coracoid process after CC ligament repair or reconstruction is a rare but serious complication that can occur independent of bone tunnels created during the index procedure [62].
- Coracoclavicular ligament reconstruction is an effective surgical approach for decreasing the incidence of subacromial osteolysis [60].
- Excellent results can be obtained with coracoacromial ligament transfer using the docking technique, decreasing the risk of recurrent distal clavicle instability [61].

Recovery

- A well-performed distal clavicle excision will likely perform better than a poorly performed one, regardless of whether an open or arthroscopic approach is chosen [1].
- Patients undergoing an arthroscopic procedure, specifically through the direct approach, can expect a faster return to activities compared with the open procedure while obtaining similar long-term outcomes [2].

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- Arthroscopic and open distal clavicle excisions both provide significant pain reduction at 1 year with no significant difference in outcome measures between groups, except for VAS pain score improvement [10].
- Clavicular resection reliably produced significant improvement in patients with persistent pain or posttraumatic arthritis, although late loss of reduction was common [13].
- For chronic symptomatic injuries, partial claviclectomy is believed to be the best procedure, offering negligible morbidity and rapid return to function [19].
- Operation should be considered only in thin patients with a prominent clavicle, those doing heavy work, or those whose work requires frequent shoulder abduction and flexion [20].
- More than 90% of patients manage to return to driving within 4 weeks and to work within 6 weeks following arthroscopic subacromial decompression and acromio-clavicular joint excision [38].
- Late reconstruction of the ligaments in young patients with complete acromioclavicular separations can yield better results than excision of the lateral clavicle, allowing patients to return to strenuous sports or heavy labor [43].
- The described single-tunnel technique for coracoclavicular and acromioclavicular ligament reconstruction results in satisfactory objective and patient-reported outcomes and return to sports while avoiding coracoid and clavicle fractures [44].
- The anatomic reconstruction complex could withstand early rehabilitation, but the decrease in the structural properties and stiffness of the clavicle should be considered in optimizing the anatomic reconstruction technique [45].
- Satisfactory outcome depends upon restoring the stability of the clavicle as well as the acromioclavicular joint [53].
- The arthroscopic partial distal clavicle beveling procedure for nonincarcerated type IV AC separations resulted in a significant reduction in pain, improved daily function, and early return to sport [58].

Key Evidence

- [L5] A well-performed distal clavicle excision will likely perform better than a poorly performed one, regardless of whether an open or arthroscopic approach is chosen. [1] ([10.1016/j.arthro.2018.03.004](https://doi.org/10.1016/j.arthro.2018.03.004))
- [L3] Among patients undergoing distal clavicle excision for acromioclavicular joint pathology, those having an arthroscopic procedure, specifically through the direct approach, can expect a faster return to activities

while obtaining similar long-term outcomes compared with the open procedure. [2] ([10.1016/j.arthro.2009.12.007](https://doi.org/10.1016/j.arthro.2009.12.007))

- [L3] Arthroscopic distal clavicle resection has provided more ‘good or excellent’ results than has the open procedure, but is comprised of low-level evidence. [3] ([10.1097/blo.0b013e31802f5450](https://doi.org/10.1097/blo.0b013e31802f5450))
- [L3] Patients with displacement greater than 100% of the thickness of the distal clavicle had poorer postoperative clinical outcomes. [5] ([10.1186/s12891-025-09190-x](https://doi.org/10.1186/s12891-025-09190-x))
- [L4] Incomplete excision and regrowth of the distal clavicle are the most common causes of revision. [6] ([10.1016/j.arthro.2009.06.010](https://doi.org/10.1016/j.arthro.2009.06.010))
- [Case_report] Regardless of the technique chosen for distal clavicle resection, portal placement remains paramount in both facilitating surgery and avoiding injury to adjacent extra-articular structures. [7] ([10.1016/j.jse.2010.08.032](https://doi.org/10.1016/j.jse.2010.08.032))
- [L5] In appropriately selected patients, open or arthroscopic distal clavicle resection is necessary to relieve symptoms. [8] ([10.5435/00124635-199905000-00004](https://doi.org/10.5435/00124635-199905000-00004))
- [Abstract] Although distal clavicle excision with 2.5 mm of bone was successful in many specimens, a 5 mm resection guaranteed no bone-to-bone abutment. [9] ([10.1016/j.jse.2007.02.105](https://doi.org/10.1016/j.jse.2007.02.105))
- [L1] Arthroscopic and open distal clavicle excisions both provide significant pain reduction at 1 year with no significant difference in outcome measures between groups, except for VAS pain score improvement. [10] ([10.1016/j.jse.2006.10.006](https://doi.org/10.1016/j.jse.2006.10.006))
- [L4] Horizontal instability of the clavicle is evident with distal clavicle resection of greater than 10 mm. [11] ([10.1016/j.xrtr.2021.05.003](https://doi.org/10.1016/j.xrtr.2021.05.003))
- [L4] The new operative procedure combines resection arthroplasty with fixation of the clavicle in an anatomical position. [12] ([10.2106/00004623-197254060-00005](https://doi.org/10.2106/00004623-197254060-00005))
- [L3] Late loss of reduction was common, and clavicular resection reliably produced significant improvement in patients with persistent pain or posttraumatic arthritis. [13] ([10.2106/00004623-198769070-00013](https://doi.org/10.2106/00004623-198769070-00013))
- [L4] In carefully selected patients with isolated ACJ pathology, arthroscopic distal clavicle excision results in statistically and clinically significant improvements in range of motion and patient-reported outcome measures. [14] ([10.1016/j.jseint.2023.07.014](https://doi.org/10.1016/j.jseint.2023.07.014))
- [L4] Excision of the outer end of the clavicle is preferred for old dislocations, while open reduction and internal fixation are not recommended due to complications and poor functional results. [15] ([10.2106/00004623-196345080-00024](https://doi.org/10.2106/00004623-196345080-00024))
- [L2] Both the direct superior approach and the indirect subacromial approach to the arthroscopic distal clavicle resection result in successful clinical outcome with clinically insignificant difference at final follow-up. [16] ([10.1177/0363546506294855](https://doi.org/10.1177/0363546506294855))
- [L4] Methods to diagnose both superior and posterior translation of the clavicle need further debate. [17] ([10.1016/j.jseint.2019.11.006](https://doi.org/10.1016/j.jseint.2019.11.006))
- [L5] Clinical examination and surgical treatment should address anatomic restoration of individual structures to optimize the mechanical capability of the claviscapular segment. [18] ([10.5435/jaaos-d-24-00360](https://doi.org/10.5435/jaaos-d-24-00360))

- [L1] Operation should be considered only in thin patients with a prominent clavicle, those doing heavy work, or those whose work requires frequent shoulder abduction and flexion. [20] ([10.2106/00004623-198668040-00011](https://doi.org/10.2106/00004623-198668040-00011))
- [L4] Older patients and females were more likely to experience postoperative complications requiring reoperations, including revision ACJR, distal clavicle excision, and irrigation and debridement. [21] ([10.1007/s00167-016-4206-y](https://doi.org/10.1007/s00167-016-4206-y))
- [L5] A 5-mm distal clavicle resection guaranteed no abutment but decreased joint stiffness. [22] ([10.1016/j.arthro.2007.07.004](https://doi.org/10.1016/j.arthro.2007.07.004))
- [L3] This records review found that 10 of 894 (1.1%) rotator cuff repairs underwent subsequent distal clavicle resection. [23] ([10.1177/2325967119844295](https://doi.org/10.1177/2325967119844295))
- [L5] The cross-sectional A-frame morphology of the superior cortex of the distal clavicle provides a reproducible landmark that is eliminated approximately 1.0 cm medial to the distal, lateral end of the clavicle, which can be used intraoperatively to determine when adequate resection has been completed. [24] ([10.1016/j.jse.2021.10.013](https://doi.org/10.1016/j.jse.2021.10.013))
- [L5] Despite technology innovations, a precise, easy to use and low-cost non-invasive method able to draw and analyze the kinematics of the shoulder complex has not been developed yet. [25] ([10.1177/17585732221090226](https://doi.org/10.1177/17585732221090226))
- [L5] This study provided normative kinematic values of scapulothoracic movements in the shoulder girdle. [26] ([10.1016/j.jseint.2022.09.014](https://doi.org/10.1016/j.jseint.2022.09.014))
- [L5] Although each technique was able to restore different elements of the joint kinematics, none of the strategies completely restored the shoulder girdle to its preinjured state. [27] ([10.1177/03635465221095231](https://doi.org/10.1177/03635465221095231))
- [L5] The trapezoid and conoid ligaments have unique functions in normal shoulder kinematics because of their anatomic attachments. [28] ([10.1016/j.arthro.2009.12.031](https://doi.org/10.1016/j.arthro.2009.12.031))
- [L5] The kinematic changes could be a potential source of pain and dysfunction in the shoulder with AC joint dislocation. [29] ([10.1177/0363546512458571](https://doi.org/10.1177/0363546512458571))
- [L5] Scapular and clavicular kinematics were affected in AC separation models. [30] ([10.1016/j.jse.2013.01.004](https://doi.org/10.1016/j.jse.2013.01.004))
- [L5] A comprehensive clinical approach emphasizing the evaluation of the extent of the anatomic injury and understanding its mechanical consequences regarding shoulder and arm function is a key in the development of guidelines for developing operative or non-operative treatment protocols and for establishing outcomes of the treatment protocols. [31] ([10.1177/17585732221122335](https://doi.org/10.1177/17585732221122335))
- [L4] The inconsistency of AC joint testing parameters and the lack of thorough translation studies indicate a necessity for increased attention in the overall assessment of shoulder stability to close the gap in the foundational biomechanical research. [32] ([10.1016/j.xrrt.2024.06.009](https://doi.org/10.1016/j.xrrt.2024.06.009))
- [L5] Anatomically, it provides sufficient tissue length, excursion, and width, and biomechanically, it is as strong as the coracoacromial ligament. [33] ([10.1016/j.jse.2006.09.007](https://doi.org/10.1016/j.jse.2006.09.007))

- [L5] No significant biomechanical differences in displacement or stiffness were seen between the anatomical landmark technique and the coracoid-based landmarks technique. [34] ([10.1177/23259671221132541](https://doi.org/10.1177/23259671221132541))
- [L5] New surgical techniques continue to evolve as more biomechanical data emerge and kinematic understanding improves. [35] ([10.5435/jaaos-d-16-00776](https://doi.org/10.5435/jaaos-d-16-00776))
- [L5] By exploring emerging concepts and strategies regarding horizontal and rotational instability and scapular biomechanics, the article aims to lay the foundation for future studies aimed at improving treatment outcomes and patient management. [36] ([10.1016/j.jseint.2023.11.018](https://doi.org/10.1016/j.jseint.2023.11.018))
- [L4] Preliminary findings revealed no detectable differences between surgically reconstructed and uninjured sides in ACJ biomechanics, range of motion, and isometric strength, while nonoperatively treated shoulders showed increased internal rotation, upward rotation, and posterior tilting. [37] ([10.1177/23259671241274707](https://doi.org/10.1177/23259671241274707))
- [L3] The results obtained in the present study suggest that more than 90% of the patients manage to return to driving within 4 weeks and to work within 6 weeks following arthroscopic subacromial decompression and acromio-clavicular joint excision. [38] ([10.1111/j.1758-5740.2010.00048.x](https://doi.org/10.1111/j.1758-5740.2010.00048.x))
- [L4] Type I and II acromioclavicular joint disruptions impair long-term shoulder function in about half of patients 10 years after injury. [40] ([10.1177/0363546508319047](https://doi.org/10.1177/0363546508319047))
- [L5] At 150 to 200 N of loading, CAL excision and acromioplasty increase the rotator cuff force required to maintain normal glenohumeral biomechanics by 25% to 30%. [41] ([10.1016/j.jse.2015.10.022](https://doi.org/10.1016/j.jse.2015.10.022))
- [L3] Centre of pressure measurement detected sensorimotor functional deficits following surgical treatment of the shoulder joint in patients with confirmed successful clinical and functional outcomes. [42] ([10.1007/s00167-021-06751-0](https://doi.org/10.1007/s00167-021-06751-0))
- [L4] Late reconstruction of the ligaments in young patients with complete acromioclavicular separations can yield better results than excision of the lateral clavicle, allowing patients to return to strenuous sports or heavy labor. [43] ([10.2106/00004623-197658060-00008](https://doi.org/10.2106/00004623-197658060-00008))
- [L4] The described technique results in satisfactory objective and patient-reported outcomes and return to sports while avoiding coracoid and clavicle fractures. [44] ([10.1016/j.jse.2017.11.032](https://doi.org/10.1016/j.jse.2017.11.032))
- [L5] The low level of permanent elongation after cyclic loading suggests that the anatomic reconstruction complex could withstand early rehabilitation; however, the decrease in the structural properties and stiffness of the clavicle should be considered in optimizing the anatomic reconstruction technique. [45] ([10.1177/0363546504264637](https://doi.org/10.1177/0363546504264637))
- [L4] Excellent clinical results were achieved, decreasing the risk of recurrent distal clavicle instability. [46] ([10.1186/1471-2474-10-6](https://doi.org/10.1186/1471-2474-10-6))
- [L4] Severe chronic symptomatic AC joint separations (Rockwood types III through V) can be repaired entirely by arthroscopy safely and effectively by transferring the coracoacromial ligament with a bone block in the distal clavicle. [47] ([10.1016/j.arthro.2009.08.008](https://doi.org/10.1016/j.arthro.2009.08.008))
- [L1] Surgical treatment may offer early benefits in pain relief and coracoclavicular distance improvement but does not enhance long-term functional outcomes and is associated with higher specific complication rates. [49] ([10.1186/s12891-024-08100-x](https://doi.org/10.1186/s12891-024-08100-x))

- [L5] The slight increase in the in situ graft force only in the posterosuperior and posterior direction after distal clavicle excision suggests only a marginal protective role of the acromioclavicular articulation. [50] ([10.1177/0363546510374447](https://doi.org/10.1177/0363546510374447))
- [L5] A bone anchor system for distal fixation in the base of the coracoid process and a medialized hole in the clavicle restored anatomy best. [52] ([10.1007/s001670050182](https://doi.org/10.1007/s001670050182))
- [L4] Satisfactory outcome depends upon restoring the stability of the clavicle as well as the acromioclavicular joint. [53] ([10.1111/j.1758-5740.2010.00102.x](https://doi.org/10.1111/j.1758-5740.2010.00102.x))
- [L4] Weighted stress radiographs significantly increased the measured elevation of the clavicle and the coracoclavicular distance compared to non-weighted views. [54] ([10.1016/j.jseint.2023.06.011](https://doi.org/10.1016/j.jseint.2023.06.011))
- [L4] There was no significant difference between open or arthroscopic distal clavicle excision (DCE). [55] ([10.1177/17585732231157090](https://doi.org/10.1177/17585732231157090))
- [L4] Although radiological assessment showed a statistically significant immediate superior clavicular displacement after this rarely required procedure, with an increased incidence in the first year following stabilization, this may not negatively influence the results of ACJ stabilization in a clinically relevant way. [56] ([10.1007/s00167-022-06978-5](https://doi.org/10.1007/s00167-022-06978-5))
- [L3] Fifteen years postoperatively, good clinical results persisted and anatomic reduction was overall maintained, often with asymptomatic ossification of the coracoclavicular ligaments. [57] ([10.1177/03635465251355958](https://doi.org/10.1177/03635465251355958))
- [L4] The arthroscopic partial distal clavicle beveling procedure for nonincarcerated type IV AC separations resulted in a significant reduction in pain, improved daily function, and early return to sport. [58] ([10.1016/j.arthro.2016.06.013](https://doi.org/10.1016/j.arthro.2016.06.013))
- [L3] This review demonstrated an incidence of 1.35 complications per 100 person-years, with clavicle and coracoid fractures occurring in 1.9 out of 100 cases. [59] ([10.1177/2325967121s00330](https://doi.org/10.1177/2325967121s00330))
- [L1] The current analysis suggests coracoclavicular ligament reconstruction as an effective surgical approach for decreasing the incidence of subacromial osteolysis. [60] ([10.1016/j.jse.2024.03.018](https://doi.org/10.1016/j.jse.2024.03.018))
- [Abstract] Excellent results can be obtained with this technique, decreasing the risk of recurrent distal clavicle instability. [61] ([10.1016/j.jse.2007.02.104](https://doi.org/10.1016/j.jse.2007.02.104))
- [L4] Fracture of the distal clavicle or coracoid process after CC ligament repair or reconstruction is a rare but serious complication that can occur independent of bone tunnels created during the index procedure. [62] ([10.1177/03635465211036713](https://doi.org/10.1177/03635465211036713))

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