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POST OPERATIVE RESULTS IN ACROMIOCLAVICULAR JOINT DISLOCATION USING THE LOCKDOWN SYNTHETIC IMPLANT:A RETROSPECTIVE CASE SERIES

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Abstract

Dislocation of the acromioclavicular joint is a common injury with a number of surgical interventions being described for its treatment.Among the different techniques developed, the LockDown synthetic implant(previously called the Nottingham Surgilig) is a synthetic ligament which has been increasingly used in the ACJ reconstruction with encouraging results.

Objective: To assess the post operative results in patients who underwent acromioclavicular joint reconstruction using the LockDown system as well as measuring the radiographic appearance in the post operative radiograph.Patients with a minimum 2year follow up were included in the study.

Methods: A retrospective case series evaluating 30 patients undergoing ACJ reconstruction with the LockDown system with at least two years of follow up.The clinical assessment was conducted before and after the operation using the Oxford shoulder score and the visual analogue pain score.Types of complications(infection rate, implant failure, bone osteolysis) as well as the radiographic appearance were also noted.

Results: The patients who underwent a Lockdown synthetic implant reconstruction for an acromioclavicular joint dislocation, improved from 24.67±2.35 to 46.8±2.35, p<0.001 in the 2year follow up appointment.According to the Visual Analogue Scale, the pain was reduced significantly from 6.87±0.33 to 1.11±0.22, p<0.001. Complications occurred in 6.6% of the patients, with 2 cases of superficial wound infections.

Conclusion: Patients who underwent a LockDown synthetic implant reconstruction had a significant improvement in their quality of life.From our case series, its widely use is totally justified, making the Lockdown system a valuable tool in the management of acromioclavicular joint dislocations.

INTRODUCTION:

Acromioclavicular(AC) joint dislocation is responsible for roughly 9% of shoulder girdle injuries.(1).One of the most common classification used the Rockwood classification, dividing these injuries into type I-VI on the basis of the radiographic findings.(2).The majority of the type I and II injuries can be treated non operatively in most of the patients.(3).While type IV-VI injuries are treated operatively due to the severity of the injury(4), the definite treatment for type III injury still remains controversial.(5).

The LockDown system(previously known as Nottingham Surgilig), was first introduced in 2001 as technique of addressing failed acromioclavicular joint surgery.(6).The system includes a braided synthetic polyester ligament with loops on both ends to reconstruct the damaged coracoclavicular ligaments.The technique involves looping the ligament around the coracoid and securing to the distal clavicle with a screw, providing strong fixation.Although originally intended for failed ACJ reconstructions, it is increasingly used the last few years as a primary method of ACJ reconstruction.(7,8).Several procedures have been introduced in the management of the ACJ dislocations, with the modified Weaver-Dunn among the most widely used.(9).Other type of procedures include single or double bundle technique as well as techniques using allograft or synthetic materials with satisfying outcome for the patient.(10-12).In our case series, the aim is to assess the clinical and radiographic results in patients who underwent an acromioclavicular joint reconstruction with the LockDown system, and to assess the impact of this technique on the quality of life of the patients.

MATERIALS AND METHODS:

This was a retrospective case series.Patients who underwent an ACJ reconstruction with the LockDown system were included with a minimum of two years follow up, starting from December 2016.The study includes operations until January 2018.Patients who underwent hook plate fixation, double end-button technique or patients with a follow up appointment less than two years were excluded from the study.Indications for ACJ reconstruction using the LockDown system were Rockwood type 3 or higher grade of ACJ dislocation and patients not improving with conservative treatment.All procedures were performed by the same upper limb specialist of our department and the following data were analyzed, diagnosis, including the grade of the ACJ dislocation according to the Rockwood classification, demographic data(age, gender, date of operation, date of injury, data of evaluation prior to operation and after the operation), type of operation(all patients underwent ACJ reconstruction using the LockDown system),Oxford shoulder score, including pre operative and post operative assessement, Visual Analogue scale(VAS) for pre and post operative pain, complications including infection rate, implant failure and evidence of bone osteolysis as well as the postoperative radiographic appearance in the post operative radiograph. All patients in this retrospective case series, have formally consented to be included in the above study and Ethics committee has approved the submitted study.

Intervention:

Procedures were performed under general anasthesia and inter scalene block.After induction of general anesthesia, patient is transferred to a beach chair position to optimize shoulder mobility during the operation.Knees are placed in slight flexion using a foam pad and the head is checked to confirm proper position and secured.Safety straps are then applied to fasten the patient to the operating table.By the time the pre operative set up is complete, a

physical examination of the shoulder follows.During the examination, the range of movements of both shoulders is noted, the act is palpated and the ease of reducibility of the acj is assessed during superioinferior pressure on the distal clavicle.After the clinical examination, the arm is sterilely prepped and draped and the arm is placed adducted next to the body.With a surgical pen, the acromion, clavicle and coracoid process are outlined as guide markings to avoid unnecessary exposure.After typical skin preparation with betadine and alcohol solution and typical preparation, the incision includes an anterior vertical longitudinal exposure between the AC joint and coracoid in order to achieve a good overall exposure of the AC joint and coraclavicular joint space.After this, subcutaneous tissue is dissected, deltotrapezoid fascia exposed and opened and the anterior and superior aspects of the clavicle exposed.Distal clavicle is then mobilized by removing scarred tissue and osteotomised from the articular surface using oscillating saw. Subdeltoid bursa is removed, and coracoid easily visualized.A LockDown length gauge loop is passed around the coracoid with a loop passer and the length of the LockDown is measured.Then, the implant is passed around the coracoid and clavicle and is secured with a screw and washer inserted from the anterior surface of the distal clavicle.Post operatively patients used a sling for 6weeks, were advised for active hand, wrist and elbow exercises with no resistance as soon as possible, while during the week 2 physiotherapy sessions with passive movements in the scapular plane were initiated.Gradually, the range of motion is increased from passive to active exercises and at week 6 the use of the sling was discontinued.

STATISTICAL ANALYSIS

During the statistical analysis, we compared the pre operative Oxford shoulder score and VAS score with the post operative data at the 9month and 2year follow up appointment.

The comparison between the pre and post operative data, regarding the different variables, was made using the t-paired test.Continues variables with parametric distribution were presented as means and standard deviations whereas, non parametric distributions as medians and percentiles.

RESULTS

Clinical outcomes:Thirty patients who underwent an ACJ reconstruction with a LockDown system and the data of the 9month follow up appointment were assessed.For all the patients included in this study, a 2year follow up appointment was noted with the 2year follow up assessment data recorded.Demographic data and the type of Acromioclavicular dislocation(Rockwood classification) at the time of operation is shown in table 1.

Comparing the pre operative and 9 month post operative Oxford shoulder score, the Oxford shoulder score increased from a mean of 24.67 with a standard deviation of 2.354 to 45.96 std 2.48, a statistical significant difference($p<0.001$).Similarly, in the VAS score scale, the post operative level of pain decreased significantly from a mean of 6.87±0.33 to 1.55±0.21, a statistically significant difference($p<0.001$).Table 2.

All the above patients were also assessed in a 2year follow up appointment, and the post operative assessment scores were compared with the 9month follow up appointment.Regarding the Oxford Shoulder Score, there was a statistically significant increase between the 9month and 2 year follow up appointment from 45.96 std 2.48 to 46.8 std 2.35, $p=0.005$.Similarly, in the Visual Analogue Pain Scale a statistically significant improvement was noted from 1.55 std 0.21(9 month appointment) to 1.11 std 0.22(2year appointment), $p<0.001$.Table 3.

Radiographic appearance:

Radiographic assessment of the coracoclavicular distance in the post operative radiograph was performed in all patients of the above study during the 9 month follow up appointment.Table 2.

The radiographic appearance of the CC distance was measured in all patients on anterioposterior radiographs of both clavicles, according to the same practice indicated by previous authors.(8,9,16).In our study the mean value of the CC distance in the 9month follow up appointment was 10.97mm with a standard deviation of 4.62, with a minimal and maximum value of 5mm and 19mm, respectively.

As indicated by several authors(18), the normal coracoclavicular (CC) distance on the anteroposterior radiograph of the clavicle is between 11-13mm and there should be no greater than 5mm difference between the left and right sides.In our case series, in 23.3% of the patients(4 cases of Rockwood type 4 and 3 cases Rockwood type 5) the post operative radiograph at the 9 month follow up appointment revealed a CC distance higher than 13mm.In all these cases though, patients experienced a significantly improved Oxford Shoulder and Vas score with no limitations in their daily activities.

Further radiographic assessment of the post operative radiographs, did not reveal any sign of ectopic ossification, calcific tendonitis or subacromial osteolysis as indicated in other similar studies.(17).

Complications:

Clinical complications were observed in 2 patients(6.6%), both cases including superficial skin infections, treated conservatively with a course of oral antibiotics for seven days.No case of Deep Venous Thrombosis, post operative respiratory infection or implant failure was noted.Complications mentioned in other studies(13,14) such as coracoid fracture, post operative subacromial impingement or clavicle fracture were not noted in this case series.

DISCUSSION

The acromioclavicular joint is a diarthrosis, surrounded by several ligamentous structures that maintain its stability, including the coracoclavicular ligaments and the AC joint and capsule. Whilst numerous operative techniques to restore AC joint stability following acute injury, have been described , the results of different techniques appear mixed and there is no clear consensus on which technique is superior.

Surgical techniques include hook plate fixation, AC ligament reconstruction (LockDown technique, modified Weaver-Dunn, double endobutton technique, K wire fixation and Fiber tape use) and AC and CC reconstruction using autograft or allograft as well as arthroscopic reconstruction.

The double looped polyester device(LockDown) is a braided polyester augmentation device used for the treatment of acromioclavicular joint dislocations.It is a synthetic device which is used for the acromioclavicular reconstruction in order to bring the clavicle down towards the coracoid, allowing the soft tissues to heal in the reduced position.It is probably the most common implant used in the United Kingdom for the Rockwood type III acute ACJ injuries and is made of polyethylene terephthalate mesh manufactured using a weaving technique(BESS Survey,2013)(15).

The results of the above study illustrate a significant clinical improvement in all patients.Considering the Oxford Shoulder score, a significant improvement from 24.67±2.35 to 46.8±2.35, $p<0.001$ in the 2year follow up appointment was noted.Similarly, the Vas score of the patients was significantly improved from 6.87±0.33 to 1.11±0.22, $p<0.001$.

Similar improvement of the Oxford Shoulder and Vas score of the patients with the LockDown technique is noted by other studies(13).In the study of Kumar et al, authors compared the results between the modified Weaver Dunn procedure and the Surgilig technique.At the 40month follow up assessment a similar improvement in the Oxford Shoulder score of the patients was noted, from 26±9 pre operatively to 45±7 post operatively.In this

study the radiographic appearance of the CC distance was not noted.

Regarding the radiographic appearance of the CC distance on the anterioposterior radiographs of both clavicles, 23.3% of the patients that underwent a Lockdown reconstruction for Acromioclavicular dislocation presented at the 9month follow up radiographic assessment with a CC distance greater than 13mm or with a difference higher than 5mm between the two sides.Interestingly, in our case series no correlation was noted between the radiographic appearance of the CC distance and the functional outcome of the patients.Similarly, in the study of Vascellari et al(19), from the comparison of the clinical and radiological results after coracoclavicular ligament reconstruction for Rockwood type 3 AC injuries, the authors highlighted that there was no statistically significant correlation between the clinical scores and the CC distances/differences on the anterioposterior radiographs.

Patients who underwent a LockDown synthetic implant reconstruction for acromioclavicular joint dislocation had a significant improvement in their quality of life, as seen from the post operative comparison of the Oxford shoulder and Vas score in the 9month and 2 year follow up assessment, respectively.Complication rate was 6.6% and all patients presented with no limitations in their daily activities.In the radiographic assessment of the CC distance at the 9month follow up appointment, 23.3% of the patients presented with a CC distance greater of 13mm or with a distance higher than 5mm in comparison to the healthy side but no clinically significant correlation was noted regarding their clinical outcomes.As a result, the LockDown synthetic implant is valuable tool in managing the AC joint dislocations with its widely use during the recent years being totally justified in our case series.

Limitations

The main limitations of the present study are the retrospective design and the small sample size.Considering the radiographic appearance of the CC distance, another limitation can be considered the radiographic assessment of the CC distance only at the 9month follow up appointment.Further, radiographic assessment of the above patients at the 2 year follow up appointment was not conducted as it was considered out of the purposes of the present study which was mainly focusing on the post operative clinical assessment of the above patients.Moreover, as mentioned above no statistically significant correlation has been noted between the radiographic appearance and the clinical scores of the patients, something that is confirmed in our present study from the comparison of the 9month follow up assessment scores.By including patients of several social groups and several ages(25-74 years) and from the comparison of our results with similar studies(13,14), we strongly believe that our study is reliable with representative results.In addition, its reliability is enhanced from the fact that all patients had a 2year follow up appointment and all patients were operated by the same surgeon, decreasing the percentage of bias.

Highlights:

- As indicated from our case series, the LockDown synthetic implant is a valuable tool in the surgical management of acromioclavicular joint dislocations.
- In all patients that underwent a LockDown synthetic implant reconstruction a statistically significant progress was noted, in the Oxford shoulder and Vas score post operatively.
- We couldn't identify any correlation between the radiographic CC appearance post operatively and the clinical outcome of the patients.Providing vertical stability to the AC joint, the LockDown system seems to provide significant pain relief and improves the range of movement of patients who sustained an unstable AC dislocation.

Footnotes

Abbreviations

OSS:Oxford shoulder score, ACJ:acromioclavicular joint, CC:coracoclavicular , VAS: visual analogue scale , STD:standard deviation

Conflict of interest: All authors have no conflict of interest and no payment or service was received from third parties during the conduction of the above study.

Tables

Table 1:

Sex	Rockwood Classsification		Age(years)
Male 80%	Rockwood Type 3 injuries.	43.3%	Mean age 40.57 years(25 74years)
Female 20%	Rockwood type 4 injuries.	36.6%	
	Rockwood type 5 injuries.	20.1%	

Table 2:

Number of Cases:30	**Pre Operative assessment**	**Post operative assessment (9 months)**
Oxford Shoulder Score	24.67±2.354	45.96±2.48, p<0.001
VAS score	6.87±0.33	1.55±0.21, p<0.001
CC distance in mm		10.97±4.62(5-19mm)

Table 3:

Number of cases:30	Post operative assessment (9 months)	Post operative assessment(2years)	P
Oxford Shoulder Score	45.96±2.48	46.8±2.35	p=0.005
VAS score	1.55±0.21	1.11±0.22	p<0.001

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