



COMPARATIVE ANALYSIS BETWEEN FUNCTIONAL AND RADIOLOGICAL OUTCOME OF ACROMIoclAVICULAR JOINT DISLOCATION MANAGED OPERATIVELY AND NON OPERATIVELY

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ABSTRACT

Acromioclavicular joint injuries represent as a variety of soft tissue injuries that can cause mild and chronic pain and the results in long-term disability due to changes in biomechanics.¹

It's a common injury, which is approx 9% of all injuries of the shoulder girdle.^{2,3}

Males are affected more commonly than females with a male:female ratio of approximately 5:1 and age group affected less than 30 years and commonly occurs in athletes and contact sport persons, in which direct injury to lateral part of shoulder is the most common mechanism of injury^{4,5}. In our study the mean constant score at 1 month of operated patients was 35.27 and non operated patients was 27 which was found to be statistically significant. Mean constant score at 3 months of operated patients was 72.09 and non operated patients was 67.33 which was found to be statistically significant. Most of the outcomes were excellent or good (70.0%) which was significantly higher than that of fair outcome (30.0%). The pain score (VAS) decreased significantly at different post-operative time intervals. In our study we found that the UCLA score increased significantly at different post-operative time intervals ($F_{3,76} = 302.45; p < 0.0001$). The mean UCLA Score at 3 months of operated patients was 20.91 and non operated patients was 18.78 which was found to be statistically significant (p-value 0.013)

Comparing the complications in the surgical group which was found to be higher as compared to the conservative group. Better radiological outcomes was found in the surgical group immediately following surgery.

KEYWORDS : Acromioclavicular joint, AC joint, AC dislocation, AC separation, Rockwood classification, AC joint reconstruction, Coracoclavicular ligaments, AC joint reconstruction outcomes

INTRODUCTION

Acromioclavicular joint injuries represent as a variety of soft tissue injuries that can cause mild and chronic pain and the results in long-term disability due to changes in biomechanics.¹

It's a common injury, which is approx 9% of all injuries of the shoulder girdle.^{2,3}

Males are affected more commonly than females with a male:female ratio of approximately 5:1 and age group affected less than 30 years and commonly occurs in athletes and contact sport persons, in which direct injury to lateral part of shoulder is the most common mechanism of injury.^{4,5}

The majority of these injuries are low grade (Grade 1, 2) and the good functional outcome can be expected with non-operative management. However, higher grade injuries (Grade 3-6) may require surgical intervention, especially in high demand professionals and athletes requiring overhead abduction activities^{6,7}. Management of AC joint injury has a debate from the time of Hippocrates and Galen, which differs in different regions of world, to decide whether conservative or surgical management produces better results with best outcome and least morbidity.⁸

Galen in 129-199 AD had AC dislocation and he did not comply to treatment of tight bandaging. The type of treatment given produces different results. Many techniques like strapping and k wire fixation and synthetic grafts are used but still there is controversy regarding treatment.⁹

AC joint dislocation incidence is 3 to 4 per 100 000 in the general population¹⁰. In developing countries, mostly conservative management is used as less expenditure. It also depends on geographic location and social and economic factors. The skill of practicing surgeon and his experience also plays a vital role.

It has become axiomatic that stable fixation and stabilization of these acromioclavicular joint dislocations enables early initiation of motion and maximises the chance for a successful result and excellent functional outcome

MATERIALS AND METHODS

Design of study:

It is a prospective study of 20 patients of acromioclavicular (AC) joint disruption who were managed on OPD and IPD basis in A.V.B.R Hospital, Sawangi, Meghe during the study period between June 2016 to September 2018. Patients with AC joint disruption were evaluated using inclusion and exclusion criteria and consent was taken, after approval by Institutional Ethical Committee.

Inclusion Criteria:

- 1) All patients with acromioclavicular joint dislocations of Rockwood grade III and above with or without its association with fracture of the clavicle.
- 2) Patients above 18 years of age.
- 3) Male and female patients.

Exclusion Criteria:

- 1) Patients not giving consent to participate in the study.
- 2) Compound fractures associated with soft tissue injury.
- 3) Patients with neurological involvement, paralysis/ paresis, hand affected with arthritic conditions like rheumatoid arthritis.
- 4) Patients treated elsewhere previously for the same condition.
- 5) Polytrauma, traumatic head injury patients and unconscious patients.
- 6) Psychiatric conditions where the patient is not cooperative.

Study Procedure:

All the patients were assessed with:-

- Detailed history regarding the injury using the proforma for clinical assessment.
- Functional evaluation was done both pre-operatively and post-operatively using Constant score and UCLA scoring system and on regular follow up on 1st, 3rd and 6th month
- Functional & radiological evaluation was done pre-operatively and post-operatively on follow up of 6 months using Taft Score
- Pain scoring was done using VAS system both pre-operatively and post-operatively and on regular follow up on 1st, 3rd and 6th month
- Radiographic evaluation - Anteroposterior view (AP) of the shoulder joint, axial view of shoulder joint, Zanca view (the

antero posterior view of A.C. joint with 10-15 degrees of cephalad tilt), and Stress X-ray with 10 kg of weight suspended around both the wrists.

- Patients were diagnosed both clinically and radiologically and mode of treatment i.e conservative and operative management was decided.

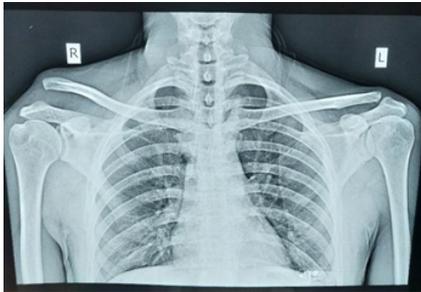


Figure 8:- Stress X ray showing AC joint disruption right side

CONSERVATIVE MANAGEMENT:

Strapping procedure



Figure 9: Conservative Management with Strapping

OPERATIVE MANAGEMENT:

Pemister procedure modified by Winkler and Pfahler

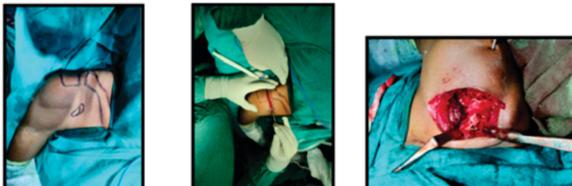


Figure 10:-Surface landmarks

Figure 11:-Site of incision

Figure 12:-AC joint reduced



Figure 12:-AC joint exposed



Figure 13:-Recon plate and Mersilen Tape inserted



Figure 15: AC joint reduction Achieved

Post Operative Protocol:

- Patients kept nil by mouth for at least 6 hours or till the bowel sounds appeared.
- Injectable antibiotics were given post operatively for 3 days followed by oral antibiotics.
- Suture removal was done in-between 10th to 12th day depending on the healing status of the skin.
- Post op dressings were done at 2nd and 7th day.
- K - wires were removed after 6 weeks and physiotherapy was started.
- For the first 2 weeks, the arm is immobilized in a universal shoulder immobilizer with active and passive movements of the elbow joint.
- Once the k - wire has been removed, uniplanar flexion is started along with abduction, extension and flexion exercises of the shoulder in scapular plane.
- Upto next 3 months, full shoulder range of motion exercises

were advised.

Observation And Results

Table-1: Distribution of surgical interventions of the patients

Surgical interventions	umber	%
Yes	11	55.0%
No	9	45.0%
Total	20	100.0%

Table-2: Distribution of return to work of the patients

Return to work	Number	%
Late	11	55.0%
Early	9	45.0%
Total	20	100.0%

Table 3 Comparison of different parameters of the patients who were underwent surgery and managed conservatively

Factors	Surgery	Mean	Std. Deviation	t18	p-value
Age (in years)	Yes	40.09	14.20	0.647	0.529 NS
	No	37.11	5.11		
Time between injury and management (in days)	Yes	4.55	1.21	7.763	<0.001*
	No	1.22	0.66		
Pre-operative Ucla Constant score	Yes	8.45	0.82	1.995	0.066 NS
	No	7.56	1.13		
Constant score at 1 month	Yes	35.27	4.45	5.737	<0.001*
	No	27.00	1.58		
Constant score at 3 month	Yes	72.09	4.70	2.175	0.044*
	No	67.33	5.00		
Constant score at 6 month	Yes	82.64	7.29	0.647	0.529 NS
	No	76.56	6.74		
Pre-operative Ucla Score	Yes	4.64	0.50	1.157	0.271 NS
	No	4.22	0.97		
Ucla Score at 1 month	Yes	10.36	2.01	0.749	0.464 NS
	No	9.78	1.48		
Ucla Score at 3 month	Yes	20.91	1.97	2.757	0.013*
	No	18.78	1.48		
Ucla Score at 6 month	Yes	26.09	3.61	1.186	0.253 NS
	No	24.00	4.15		
Pre-operative TAFT Score	Yes	2.63	0.67	0.71	0.48 NS
	No	2.44	0.52		
TAFT Score at 6 month	Yes	8.09	1.13	1.43	0.16 NS
	No	7.44	0.88		

Table-4: Comparison of different parameters of the patients who were underwent surgery and managed conservatively (continued)

Factors	Surgery	Mean	Std. Deviation	t18	p-value
Pre-operative Pain Score (VAS)	Yes	6.73	0.78	0.507	0.619 NS
	No	6.56	0.72		
Pain Score (VAS) at 1 month	Yes	3.27	0.46	1.887	0.084 NS
	No	2.67	0.86		
Pain Score (VAS) at 3 month	Yes	1.55	0.52	2.968	0.011*
	No	0.56	0.88		
Pain Score (VAS) at 6 month	Yes	0.27	0.46	0.901	0.380 NS
	No	0.11	0.33		
Flexion at 1 month	Yes	40.00	5.91	1.175	0.257 NS
	No	36.67	6.61		
Flexion at 3 month	Yes	85.00	14.49	1.292	0.215 NS
	No	75.56	17.57		
Flexion at 6 month	Yes	113.1	16.62	1.347	0.197 NS
	No	102.2	19.22		
Extension at 1 month	Yes	18.18	6.80	0.544	0.595 NS
	No	16.11	9.61		

Extension at 3 month	Yes	24.09	8.31	0.84	0.414 NS
	No	20.56	10.13		
Extension at 6 month	Yes	29.55	2.69	1.041	0.312 NS
	No	28.33	2.50		
Abduction at 1 month	Yes	38.64	5.04	0.712	0.491 NS
	No	36.11	9.61		
Abduction at 3 month	Yes	84.55	19.93	1.537	0.143 NS
	No	70.00	21.93		
Abduction at 6 month	Yes	101.3	13.43	2.065	0.054 NS
	No	90.00	11.18		
Adduction at 1 month	Yes	11.27	2.01	1.273	0.228 NS
	No	9.44	3.91		
Adduction at 3 month	Yes	16.82	4.04	1.364	0.191 NS
	No	14.22	4.38		
Adduction at 6 month	Yes	20.45	3.50	2.012	0.060 NS
	No	17.22	3.63		

surgery and managed conservatively (continued)

Factors	Surgery	n	Mean	Std. Deviation	t18	p-value
Range of Motion (IR) at 1 month	Yes	11	13.64	3.23	0.488	0.635 NS
	No	9	12.44	6.71		
Range of Motion (IR) at 3 month	Yes	11	22.27	5.64	0.017	0.986 NS
	No	9	22.22	7.120		
Range of Motion (IR) at 6 month	Yes	11	28.64	2.335	1.293	0.224 NS
	No	9	26.11	5.465		
Range of Motion (ER) at 1 month	Yes	11	15.45	4.156	0.949	0.363 NS
	No	9	18.33	8.292		
Range of Motion (ER) at 3 month	Yes	11	25.00	7.746	0.449	0.659 NS
	No	9	23.33	8.660		
Range of Motion (ER) at 6 month	Yes	11	31.82	4.045	1.688	0.115 NS
	No	9	27.78	6.180		

Table-6: Mode of management and outcome of the patients

Mode of management	Excellent	Good	Fair	Total
Conservative management	3	5	3	11
Row %	27.3	45.5	27.3	100.0
Col %	60.0	55.6	50.0	55.0
Strapping	2	4	3	9
Row %	22.2	44.4	33.3	100.0
Col %	40.0	44.4	50.0	45.0
TOTAL	5	9	6	20
Row %	25.0	45.0	30.0	100.0
Col %	100.0	100.0	100.0	100.0

Table-7: Outcome and TAFT score at 1 month and 6 month of the patients

Outcome	TAFT score at 1 month (Mean±s.d.)	TAFT score at 6 month (Mean±s.d.)
Excellent	2.80±0.44	8.80±1.30
Good	2.38±0.74	8.00±0.53
Fair	2.57±0.53	6.86±0.37

Table-8: Type of management and outcome of the patients

Final Outcome	Type of management		TOTAL
	Surgery	Conservative	
Excellent	3	2	5
Row %	60.0	40.0	100.0
Col %	27.3	22.2	25.0
Good	5	4	9
Row %	55.6	44.4	100.0
Col %	45.5	44.4	45.0
Fair	3	3	6
Row %	50.0	50.0	100.0
Col %	27.3	33.3	30.0

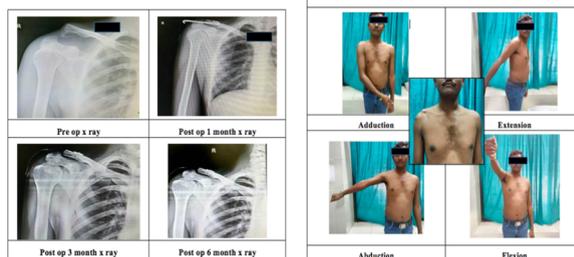
TOTAL	11	9	20
Row %	55.0	45.0	100.0
Col %	100.0	100.0	100.0

Table-9: Type of management and complications of the patients

Complications	Type of management		TOTAL
	Surgery	Conservative	
Yes	4	2	6
Row %	66.7	33.3	100.0
Col %	36.4	22.2	30.0
No	7	7	14
Row %	50.0	50.0	100.0
Col %	63.6	77.8	70.0
TOTAL	11	9	20
Row %	55.0	45.0	100.0
Col %	100.0	100.0	100.0

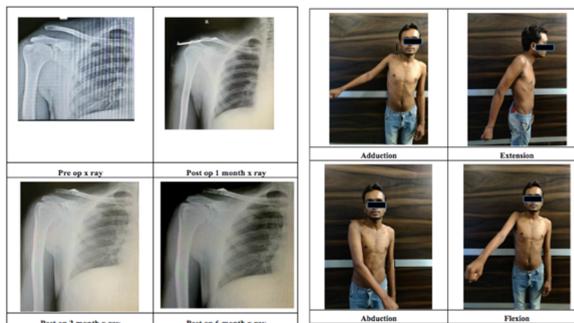
Case 1

35/Male, AC joint disruption right side



Case 2

26/Male AC joint dislocation right side



DISCUSSION

In our study, ANOVA followed by Tukey's test showed that the constant score increased significantly at different post-operative time intervals ($F_{3,76}=778.13; p<0.0001$).

Bernd A. Leidel¹¹ in his study found that all patients had a good functional outcome which was not related to the follow up period in long term, constant score of 88(+10) points.

Verdano et al¹² found that constant score accounted for 92.7 points Gstettner et al¹³ in their study found that the mean constant score was 80.7+12.9 in conservatively treated patients and 90.4+12.9 in operative group.

In our study the mean constant score at 1 month of operated patients was 35.27 and non operated patients was 27 which was found to be statistically significant (p-value<0.001).

In our study the mean constant score at 3 months of operated patients was 72.09 and non operated patients was 67.33 which was found to be statistically significant (p-value 0.044)

Kienast B et al¹⁴ in his study of mid-term results after operative treatment of Rockwood grade III-V acromioclavicular joint dislocations with an AC-hook-plate found that 313 patients

suffering from Rockwood III-V lesions of the AC joint with an AC-hook plate. 225 (72 %) of these patients could be followed up) Constant score showed an average of 92.4 of 100 possible points.

Salem KH et al¹⁵ in his study of treatment of Tossy III acromioclavicular joint injuries using hook plates and ligament suture, 25 patients (mean age 41 years) had complete Tossy III AC joint disruptions. Using the Rockwood classification, 15 dislocations were classified as type V injuries, 9 as type III injuries, and 1 as a type IV injury. A retrospective clinical and radiographic evaluation of 23 patients was performed after an average follow-up period of 30 months. The mean Constant score was 97 (range, 90-100) points.

Scheibel M et al¹⁶ in his study on arthroscopically assisted stabilization of acute high-grade acromioclavicular joint separation Twenty-eight patients (2 women and 26 men; mean age, 38.8 years [range, 18-66 years]) could be evaluated after a mean follow-up of 26.5 months (range, 20.1-32.8 months) the mean CS was 91.5 points (range, 84-100) (contralateral side: mean, 92.6 points),

In our study ,most of the outcomes were excellent or good (70.0%) which was significantly higher than that of fair outcome (30.0%) (Z=2.82;p<0.0001).

A Lizaar et al¹⁷ 40 patients had excellent results (87%) ,3 (6.5 %) good ,3 (6.5%) fair and no poor results.

In our study results showed that the pain score (VAS) decreased significantly at different post-operative time intervals (F_{3,76} =330.53;p<0.0001).

In our study, Mean Pain Score (VAS) at 3 months of operated patients was 1.55 and non operated patients was 0.56 which was found to be statistically significant (p-value 0.011).

A Lizaar¹⁷ et al in his study found that 42 (91.3%) patients had no pain; 1 had slight pain on occasion but no other disability, and 3 (6.5%) had mild pain.

Kienast B et al¹⁴ in his study of mid-term results after operative treatment of Rockwood grade III-V acromioclavicular joint dislocations with an AC-hook-plate found that 313 patients suffering from Rockwood III-V lesions of the AC joint with an AC-hook plate. 225 (72 %) of these patients could be followed up. The postoperative pain on a scale from 1 to 10 (VAS-scale) was rated 2.7 in the conventional group and 2.2 in the minimal invasive group.

In our study we found that the UCLA score increased significantly at different post-operative time intervals (F_{3,76}=302.45;p<0.0001).

In our study,mean UCLA Score at 3 months of operated patients was 20.91 and non operated patients was 18.78 which was found to be statistically significant (p-value 0.013)

A Lizaar et al¹⁷ in his study found that the mean UCLA score was 30.8 (12 to 35), which was not significant (p=0.071).

In our study most of the patients returned to work late (55.0%) which was higher than that of the patients with early return to work (45.0%) but it was not significant (Z=1.41;p=0.16)

All the patients with conservative management returned to work early and all the patients with surgical intervention returned to work late.

Verdano et al¹² in his study found that the mean time to return to work/ sports activity was 13.5 weeks (range, 8-17 weeks). All patients returned to normal life after a mean period of 4.7 months (range, 4-7 months) from surgery.

Mean pre-operative Taft score for surgically managed patients was 2.63 and for conservative group was 2.44 but it was not significant Mean Taft score for surgically managed patients after 6 months was

8.09 and for conservative group was 7.44 but it was not significant.

Stein T et al¹⁸ in his study on stabilization of acute high-grade acromioclavicular joint separation using clavicular hook plate versus the double double-button suture procedure in which 73 consecutive patients with acute high-grade AC joint separation were prospectively followed in 2 treatment groups (64.4% randomized, 35.6% patient-selected treatment): open reduction and cHP (cHP group) or arthroscopically assisted dDBS (dDBS group) performed within 14 days of injury found that All patients showed significantly increased Taft scores after surgery as compared with preoperative status . As compared with group 1 ,group 2 had significantly better outcomes at 24 months (Taft: cHP = 9.4 ± 1.7 vs dDBS = 10.9 ± 1.1, and at 24 months for Rockwood IV/V (Taft: cHP = 9.4 ± 1.7 vs dDBS = 11.1 ± 0.8.

Hann C et al¹⁹ in his study of combined arthroscopically assisted coraco- and acromioclavicular stabilization of acute high-grade acromioclavicular joint separations found that 59 patients (6 female/53 male; median age 38.3 (range 21.5-63.4 years) who sustained an acute high-grade AC-joint dislocation (Rockwood type V) at a median follow-up of 26.4 (range 20.3-61.0) months, 34 patients scored 11 (4-12) points in the Taft score.

Metzlaff S²⁰ in his study on surgical treatment of acute acromioclavicular joint dislocations of hook plate versus minimally invasive reconstruction found that 44 patients with an acute (within 2 weeks after trauma) complete AC joint separation (35 male, nine female; median age 36.2 years, range 18-56) underwent surgical repair with either a minimally invasive AC joint repair or a conventional hook plate. All patients were available after a median follow-up of 32 months (range 24-51). There were no significant differences in the mean constant and Taft score between the two groups.

Zhang JW et al²¹ in his study on operative treatment of acromioclavicular joint dislocation with suture anchors found that 28 patients with acute traumatic Rockwood III, IV and V dislocations of the acromioclavicular joint who were surgically treated from October 2010 and January 2012 had mean Taft shoulder rating of 10.7 points (range, 8-12) at 12 months.

Kienast B et al¹⁴ in his study of mid-term results after operative treatment of Rockwood grade III-V acromioclavicular joint dislocations with an AC-hook-plate operated 313 patients suffering from Rockwood III-V lesions of the AC joint with an AC-hook plate. 225 (72 %) of these patients could be followed up. Mean operation time was 42 minutes in the conventional group and 47 minutes in the minimal invasive group. The postoperative pain on a scale from 1 to 10 (VAS-scale) was rated 2.7 in the conventional group and 2.2 in the minimal invasive group. Taft score showed very good and good results in 189 patients (84%). Constant score showed an average of 92.4 of 100 possible points with 89 % excellent and good results and 11 % satisfying results.

Salem KH et al¹⁵ in his study of treatment of Tossy III acromioclavicular joint injuries using hook plates and ligament suture, 25 patients (mean age 41 years) had complete Tossy III AC joint disruptions. Using the Rockwood classification, 15 dislocations were classified as type V injuries, 9 as type III injuries, and 1 as a type IV injury. A retrospective clinical and radiographic evaluation of 23 patients was performed after an average follow-up period of 30 months. The mean Constant score was 97 (range, 90-100) points, and the mean Taft score was 10.6 points.

Pfahler M et al²² in his study of surgical treatment of acromioclavicular dislocation, 65 patients were operated on for acromioclavicular dislocation between 1980 and 1991. Seventeen type II and 48 type III dislocations according to the criteria of Tossy et al. were treated. Three different surgical techniques were employed. (1) tension band wiring, (2) a modification of the Bosworth repair, (3) reconstruction of the ligaments with augmentation by a PDS

(polydioxanon) cord. Forty-four patients could be investigated retrospectively, and an additional 12 were recorded by questionnaire. The Taft score was used, representing self-assessment, clinical statements and radiological findings. Of all investigated patients 87.5% had a normal range of motion without any loss of strength, and 32% suffered an osteoarthritis of the acromioclavicular joint. The average Taft score was 9.8. With respect to the three surgical techniques, reconstruction of the ligaments augmented by a PDS cord produced the best result, an average Taft score of 10.8.

Jensen G et al²³ in his study on arthroscopically assisted stabilization of chronic AC-joint instabilities in graffrope technique with an additive horizontal tendon augmentation, 20 patients with chronic symptomatic ACJ instability were stabilized. 16 patients were followed-up clinically and sonographically. Sixteen patients (n = 2 female, n = 14 male, median age 40 (21-61) years, follow-up rate 84 %) were evaluated median 13 months (range 4-27 months) after indexed operation. 11 patients had a chronic ACJ instability after Rockwood type III, and 5 patients after Rockwood type V lesion. 6 patients suffered a recurrent symptomatic instability after operative treatment. 10 patients of the group were primary stabilized with the new technique. 15 of 16 patients were satisfied with the result of the operation at the follow-up examination. The VAS was median 4.6 of 10 points (range 1.1-7.4 points). The adjusted CS was median 84 % (range 46-93 %) and TS median 9 points (range 5-12 points).

Scheibel M et al¹⁶ in his study on arthroscopically assisted stabilization of acute high-grade acromioclavicular joint separations, twenty-eight patients (2 women and 26 men; mean age, 38.8 years [range, 18-66 years]) could be evaluated after a mean follow-up of 26.5 months (range, 20.1-32.8 months). The interval from trauma to surgery averaged 7.3 days (range, 0-18 days). The mean CS was 91.5 points (range, 84-100) (contralateral side: mean, 92.6 points), the mean TS was 10.5 points (range, 7-

CONCLUSION

In my study as I compared the surgical outcomes of acromioclavicular joint dislocations with conservative treatment and found to have

1. Patients with conservative management returned to work early as compared to the patients with surgical intervention
2. Patients who were managed surgically had better cosmetic results than patients managed conservatively.
3. The proportion of patients with excellent to good outcome was higher in surgical group than that of conservative group.

Comparing the complications in the surgical group which was found to be higher as compared to the conservative group. Better radiological outcomes was found in the surgical group immediately following surgery.

Finally, there was no significant difference in radiological and functional outcome between patients managed conservatively and operatively in long term followup

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