Extended Abstract Journal Plastic Surgery and Cosmetology 2018
Vol. 1 No.2

A prospective study of prognostic factors affecting the functional outcome of open rotator cuff repairs

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Introduction:

In 1834, Smith - first summary of a rupture of the rotator cuff tendon. Among most common causes of shoulder pain and instability. Disease severity range from inflammation and edema to

Irreparable ruptures. Incidence 5-40% with increasing with advancing age. Normal senescence process. Rotator cuff pathology is a common problem in old age. Rotator cuff injury can occur in younger patients and the cause is usually trauma.

Open Rotator Cuff Repair:

Open rotator cuff repair was first performed by the Dr CODMAN in 1911. Further modification by NEER in 1972 and Bigliani et al in 1992. Clinical outcomes-Good to excellent functional improvement in 75%-95% patients. Pain relief in 85%- 100% patients. It is the traditional method which has been the gold standard.

Specifically indicated in

- Repairs of massive ruptures with a defect longer than 5 cm and
- Involvement of at least 2 tendons

In this method of repair the

1. Transosseous fixation of the tendon to the bone is easier and
2. This transosseous fixation helps in replicating the footprint of the supraspinatus tendon and theoretically helps in better potential for healing.
3. Open transosseous techniques can capture a wider section of the rotator cuff footprint leading to a more secure repair.

Although the development of reliable, procedure specific, arthroscopic instrumentation and various fixation methods have led to arthroscopically assisted rotator cuff repair techniques, open rotator cuff repair continues to be used by many surgeons, particularly for large or massive tears.

Open cuff repair is performed in these instances, as the quality of the remaining tissue may be poor and significant tendon retraction and adhesions are likely, making arthroscopic rotator cuff repair challenging. Open, Mini-open, and All-Arthroscopic Rotator Cuff Repair Surgery.

Aims and Objectives:

- To study prognostic factors likeAGE of the patient
- SIZE OF TEAR of the muscle tendon
- NUMBER OF TENDONS of the rotator cuff muscles torn
- ATROPHY of the torn muscle tendon

Affecting the functional outcome of the Rotator cuff repairs done by the OPEN ROTATOR CUFF REPAIR METHOD

Materials and Methods:

- size: 42 patients
- Study period: January 2018 to December 2018
- Study Population: Patients who were admitted in the hospital and underwent Open Rotator cuff Repair for full thickness tears along with post operative rehabilitation.
- Study type: Prospective type
- Study hospital: Akshaya Hospital, Narsipatnam, Andhra Pradesh

Study source:

The study was a prospective study conducted at Akshaya hospital,Narsipatnam. A specialized Orthopedic Centre located in Andhra Pradesh. 42 full thickness complete rotator cuff tears admitted in AKSHAYA HOSPITAL from January 2018 to December 2018 are selected for the study. Consent has been taken from each patient explaining the thesis. All preoperative, intra operative and postoperative details were recorded from the case sheets.

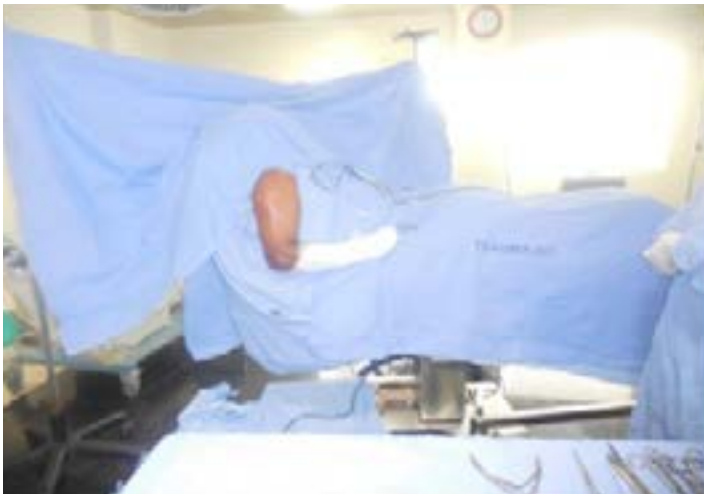
Data was collected:

1. Manually at follow up of patients,
2. From discharge summary,
3. Operation theater register,
4. Picture Archiving and Communication system (PACS)

And then entered into a Microsoft Excel spreadsheet. All details were recorded in a special pro-forma

Surgery Procedure:

Brachial plexus block and Beach chair position



Incision:

- From tip of acromion 4 cm downwards on lateral aspect of shoulder.
- Deltoid was split and detached from acromial end.
- Sub acromial decompression and acromioplasty was done.
- Supraspinatus tear was identified.
- Bony Trough made at the greater tuberosity level.
- Bone to Tendon repair was done with fiber wire and single suture anchor.
- After Transosseus repair re-attachment of deltoid to acromial end is done.

Tear and bony trough

Transosseous Repair

To evaluate functional outcome we are using

Constant shoulder score

Both preoperatively and post operatively at 1 year

DASH Score postoperatively at 1year

By doing multiple regression analysis statistically, we are going to evaluate how the Prognostic factors affecting the functional outcome of Rotator cuff repairs done by OPEN technique.

Inclusion and Exclusion criteria:

INCLUSION CRITERIA	EXCLUSION CRITERIA
Full thickness Rotator cuff tears	1. Glenohumeral instability.
	2. Adhesive capsulitis.
	3. Glenohumeral arthritis
	4. History of shoulder surgery.
	5. Greater tuberosity avulsion fractures
	6. Partial thickness rotator cuff tears.

Patient Demographics:

Total number of patients: 42

1. Males: 28 (66.6%).

2. Females: 14 (33.3%).

SIDE OF THE TEAR -	NUMBER OF PATIENTS
RIGHT SIDE -	30
LEFT SIDE -	12
DOMINANT/NONDOMINANT LIMB -	NUMBER OF PATIENTS
DOMINANT SIDE -	32
NONDOMINANT SIDE -	10
ETIOLOGY OF TEAR -	NUMBER OF PATIENTS
TRAUMATIC -	32
NON TRAUMATIC -	10

Prognostic Factors:

- To study prognostic factors like
- AGE of the patient
- SIZE OF TEAR of the muscle tendon
- NUMBER OF TENDONS of the rotator cuff muscles torn
- ATROPHY of the torn muscle tendon

Age of patient:

- Mean age group is 57.5 years
- Minimum age group is 37 years
- Maximum age group is 76 years

AGE GROUP (in YEARS) -	NUMBER OF PATIENTS
> 60 YEARS -	14
60 AND <60 YEARS -	28

Size of tear:

Cofield Classification of Rotator Cuff Tears (Cofield 1982)

Small: < 1cm

Medium: 1-3 cm

Large 3-5: cm

Massive: >5cm

Tear size:

Tear size was measured in sagittal direction

Cuff tear retraction in the frontal plane: Patte Classification

Stage 1: Proximal stump close to bony insertion

Stage 2: Proximal stump at level of humeral head

Stage 3: Proximal stump at glenoid level

Patte D, CORR, (254) 81-86, 1990

Size Of Tear	Number of Patients
Small (<1 cm)	6
Medium(1-3 cm)	18
Large (3-5 cm)	9
Massive(>5 cm)	6
Massive(>5 cm)	6

Number of tendons torn

Number Of Tendons Torn	Number of Patients
Supraspinatus	20
Infraspinatus	2
Subscapular is	1
Supraspinatus+Infraspinatus	14
Supraspinatus+Subscapularis	2
Supraspinatus+Infraspinatus+Subscap Ularis	3

Tendon quality:

Originally described by Goutallier, fatty degeneration is a degenerative condition of the tendon-muscle unit of rotator cuff muscles, which incurs after rotator cuff tearing, characterized by atrophy of muscle fibers, fibrosis, and fatty accumulation within and around the muscles.

Mostly occurring in elderly patients, it is frequently associated with an aging-related reduction of the regenerative potential of rotator cuff tendons.

Fatty degeneration of cuff muscles:

Goutallier's classification

Prognostic importance. Stages 3 and 4 have less chance of return to function

Stage 0 - Normal muscle

Stage 1 - Some fatty streaks

Stage 2 - Less than 50% fatty muscle atrophy

Stage 3 - 50% fatty muscle atrophy

Stage 4 - Greater than 50% fatty muscle atrophy.

Atrophy of muscle based on Goutallier grading

Goutallier Staging	Number of Patients	Mean Pre Op Constant Score
Grade 0,1,2	-22	29.4
Grade 3 and 4	20	25.3

Statistical Analysis:

We entered the data in to Microsoft excel sheet. The difference between pre op and post op constant scores, and between different groups of prognostic factors are statistically analysed by Paired Student T test.

Results:

Operative Status	Mean Constantscore	P -Value
PRE OP	28.02	P< 001SIGNIFICANT
POST OP 1 YEAR	20	
FOLLOW UP	84.05	

Post op constant score

Post Op Constant Shoulder Score	Number Of Patients
EXCELLENT (91-100)	8
GOOD (65-90)	30
FAIR (50-64)	1
POOR (0-49)	0

Age

Age	Mean Pre Opconstantscore	Mean Post Op(1year)Constant Score
>60 YEARS	27.8	82.84
60 AND <60YEARS	28.7	84.65

Tendon Size

Size of Tear	Mean Preop-constantscore	Mean Po-stop(1 Year) Constantscore	P- Value
Small And Medium (3 And <3cm)	29	84.11	0.497
60 AND <60YEARS	26.4	83	84.65

Number of Tendons Torn

Number Of Tendons Torn	Mean Pre Op Constant Score	Mean Post Op (1 Year) Con-stant Score	P -Value
Single Tendon	29.8	84.625	0.619
Mutiple Tendons	25.6	83.65	

Atrophy of Tendon

Number Of Tendons Torn	Mean Pre Op Constant Score	Mean Post Op (1 Year) Con-stant Score	P -Value
STAGE 0,1,2	29.4	84	0.023
STAGE 3,4	25.3	71.1	Significant

Discussion and Review Literature:

The aim of open rotator cuff repair in rotator cuff tear patients is to meet the overall satisfactions of the patient and pain relief along with functional improvement. Rotator cuff tear when repaired usually gives good results. Lam et al have suggested a good functional outcome and pain relief

after open repair in massive full thickness rotator cuff tear in the elderly. At end of our study, total patients completed 1 year follow up are 39, with minimum follow up of 12 months and maximum follow up of 18 months.

Age of the patient:

Age of the patient is one of the prognostic factors we studied to know the affect of the age on the functional outcome at 1 year post operative period. In our study mean age of patients is 57.5 years and we divided the patients in to > 60 years(33.3%) and 60 and < 60 years(66.6%) , and all patients completed 1 year follow up. Since most of our patients in the study are around 60 years ,we are not able to find statistically any significant difference between 2 groups. But there is increase in post operative functional constant score after 1 year in both groups and is almost equal in both groups. Oh et al in his study told that age has not been proven to be an independent

factor and should not be the only variable to consider in the clinical decision about surgery or not.In systemic review by Frederik O, Lambers Heerspink told that , although tear size and age negatively influence cuff integrity, they did not find evidence for these prognostic factors having a negative influence on functional outcome. Factors like age would logically influence functional and radiologic outcome. Increasing age is proportionately associated with RCT size.

Although tear size and age negatively influence cuff integrity, we did not find evidence for these prognostic factors having a negative influence on functional outcome.

Size of Tear:

Size of the tear of the rotator cuff muscle involved is the second prognostic factor ,we studied to know how it is affecting the functional outcome of the functional outcome at 1 year postoperative period. In our study there is no significant difference (P Value 0.497) between the functional outcome of the patients of the 2 groups with size of tear < 3cm and > 3cm. In our study total 39 patients completed I year follow up ,of this 24(61.5 %) patients are with size of tear 3 and <3 cm and 15(38.4%) patients are with size of tear >3 cm. And in all our patients there is increase in post operative constant score at 1 year follow up. And the post operative constant score is good (65 – 90) in the patients of 2 groups at the end of 1 year follow up.

Multiple Tendons:

Number of rotator cuff muscles tendon torn is the third prognostic factor, we studied to know how it is affecting the functional outcome at 1 year post operative period. In our study there is no significant difference (p value 0.169) between the functional outcome of the patients of 2 groups with single rotator cuff tendon repair and multiple rotator cuff tendon repairs. Out of 39 patients completed 1 year follow up, 22 (56.4%) patients are with single tendon torn and 17(43.5%) patients are with multiple tendon torn and repair. At the end of 1 year follow up, in patients of 2 groups, constant score is good (65 – 90). In study by Gulotta et al, found that no significant influence of multiple tendons torn on functional outcome. Perry et al. 2009 told that, more than 1 full thickness cuff tear results in worse mechanical properties and worse shoulder function after repair. Found no significant influence on functional outcome of the number of tendons involved (OR, 1.04; 95% CI, 0.31-3.49).

Atrophy of Tissues and Fatty Infiltration:

Atrophy of tissues and fatty infiltration is the fourth prognostic factor; we studied to know how it is affecting the functional outcome at 1 year post operative period. In our study there is a significant difference (p value: .023) between the functional outcome of the patients of 2 groups with atrophy of tissues and fatty infiltration stages 0,1,2 and stages 3 and 4. Out of 39 patients completed 1 year follow up, 20(51.2%) patients are with stages 0,1,2 and 19(48.2 %) patients are with stages of 3 and 4. At the end of 1 year follow up, in patients of 2 groups, constant score is

Good (65 – 90). In a study by Nho et al, found that there is a significant negative influence of

tissue quality on cuff integrity at follow up. In a study done by Lafosse et al , found that there is no influence on functional outcome of fatty infiltration of rotator cuff assessed by CT or MRI.

In study by Gladstone et al, in his study assessed the tissue quality of rotator cuff by MRI.

Functional outcome in our study is studied by using constant shoulder score. In our study there is a significant difference (p value 0.001) ,between the patients of study groups of pre operative constant score and post operative constant score at end of I year follow up. In study done by Narayana prasad, Abraham odumala, Farah elias et al, also shows that there is a significant difference between the pre operative constant score and post operative constant score.

Conclusion:

Prognostic factors like age, tendon size and number of tendons are not affecting the functional outcome of patients of our study. And the only prognostic factor affecting the functional outcome of patients in our study is atrophy of tissues and fatty infiltration. Functional outcome score was good in all patients with stage 3 and 4 atrophy. Of this 93% patients have pain relief , especially relief from night pain and ability to perform normal day to day activities. And in 90 % of patients, the shoulder range of movements, mainly abduction and external rotation are full range and painless. And also functional outcome is good in patients with stage 3 and 4 atrophied and fatty infiltrated tissues, if repair of tissues is done by open technique. By open method of rotator cuff repair, we repaired the rotator cuff muscles tendon by cuff mobilization along with side to side repair of the tendons and robust transosseous tendon repair fibre wire and repair is reinforced by suture anchor. All the tears are repaired by Burkhart technique and force couples are restored.

We feel that although atrophy of muscle and fatty infiltration is significant negative factor, the overall patient satisfaction and pain relief from the procedure together with functional improvement makes open repair of rotator cuff tendon a valuable option. So we conclude that the only factor that influencing the outcome in our study is repair of the rotator cuff.