

## Results

### **Results**

Results of conservative and surgical (reconstruction) management of chronic isolate ACL injury were reported according to the IKDC scale.

The IKDC form has two data sections:

documentation section and evaluation section. The latter has seven problem areas that collectively contribute to the final evaluation grade (assessment).

All data of both sections were examined statistically for significance in relation to the final evaluation result (grade). Each item of the seven problem area (evaluation section) was qualified as A, B, C or D grade according to the parameters of qualification recommended in the form.

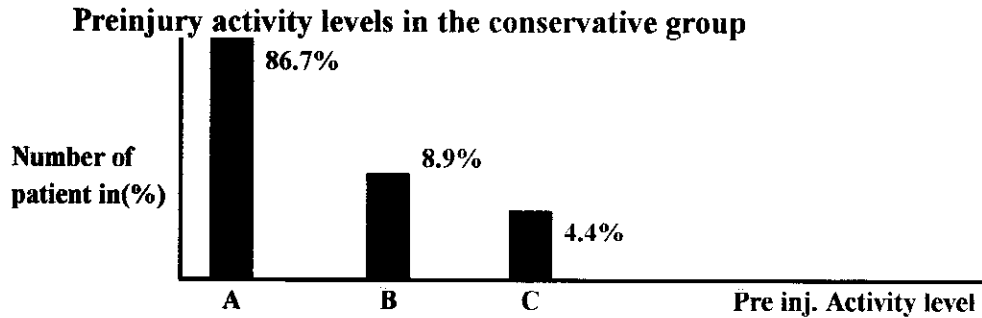
Activity levels (preinjury, pre-reconstruction and postmanagement) were evaluated also in grades: A (strenuous activity), B (moderate activity), C (light activity) and D (sedentary activity).

#### Conservative Group

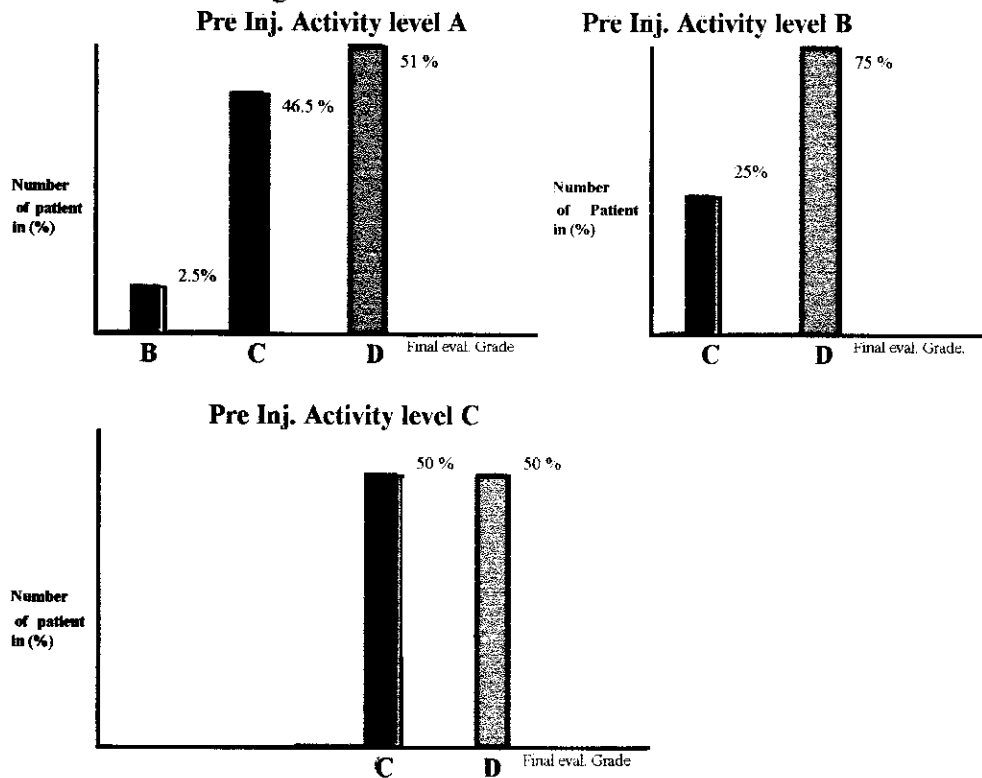
45 cases managed conservatively were evaluated by IKDC scale. The data was subjected to statistical evaluation and relation of different items to the final evaluation grade was examined.

#### Documentation Section Results

- **Age:** age at the time of index injury was not significantly related to the final evaluation grade ( $P=0.15$ ).
- **Sex:** showed no statistical significance ( $P=0.2$ ) in relation to final evaluation grade.
- **Involved knee:** showed no statistical significance ( $P=0.6$ ) in relation to final evaluation grade.
- **Cause of injury:** was insignificant in relation to final evaluation grade ( $P=0.7$ ).
- **Type of sport:** was insignificant in relation to final evaluation grade ( $P=0.4$ ).
- **Preinjury activity level:** was insignificant in relation to final evaluation grade ( $P=0.3$ ).



\* Distribution of patients with different preinjury activity levels in relation to final evaluation grades.

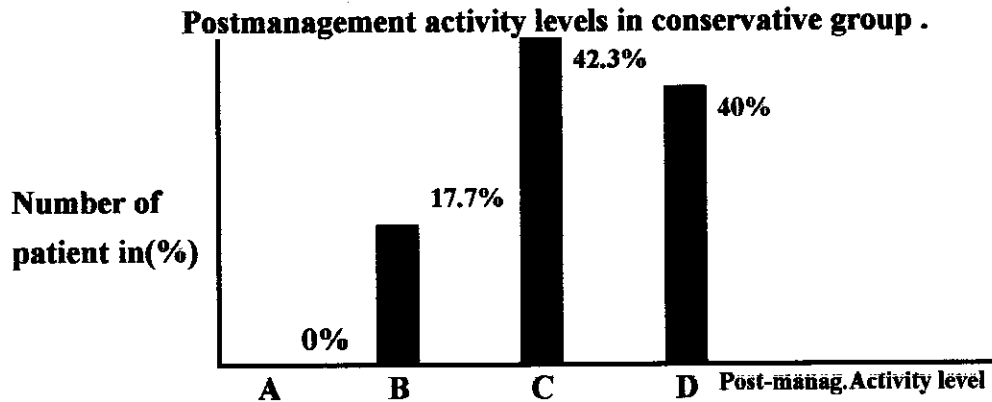


75% of patients with preinjury activity level B. got final evaluation grade D, where 51% and 50% of patients with preinjury activity levels A. and C respectively got final evaluation grade D.

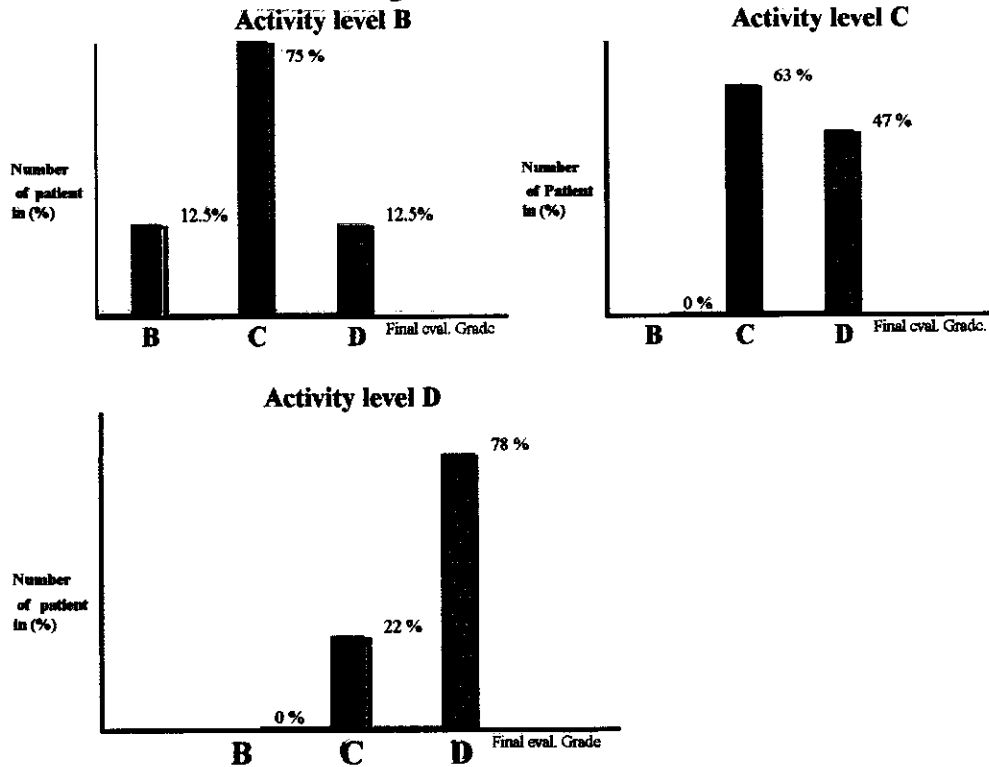
- **Postmanagement activity level**

This was highly significant as regards the final evaluation grade. ( $P=0.0117$ )

–Postmanagement activity levels distribution in the group of conservative management.



- Distribution of patients with different postmanagement activity levels in relation to final evaluation grades.



No patient got postmanagement activity level A.

12.5% of patients with postmanagement activity level B, got final evaluation grade D. where 47% and 78% of patients with postmanagement activity level C. and D. got final evaluation grade D.

Low postmanagement activity levels were associated with poor final evaluation grades.

12.5% of patients with postmanagement activity level B, got final evaluation grade D. where 47% and 78% of patients with postmanagement activity level C. and D. got final evaluation grade D.

Low postmanagement activity level were associated with poor final evaluation grades.

**Relationship between preinjury activity level and postmanagement activity level.**

	Level A Unlimited Activity level	Level B Heavy manual works (tennis)	Level C Jogging, Running	Level D house work ADL
Preinjury activity level	39 (86.7 %)	4 (8.4 %)	2 (4.4 %)	-----
Post management activity level	-----	8 (17.7 %)	19 (42.3 %)	18 (40 %)

No patient had preinjury activity level D (sedentary activities). No patient had postmanagement activity level A (strenuous activities).

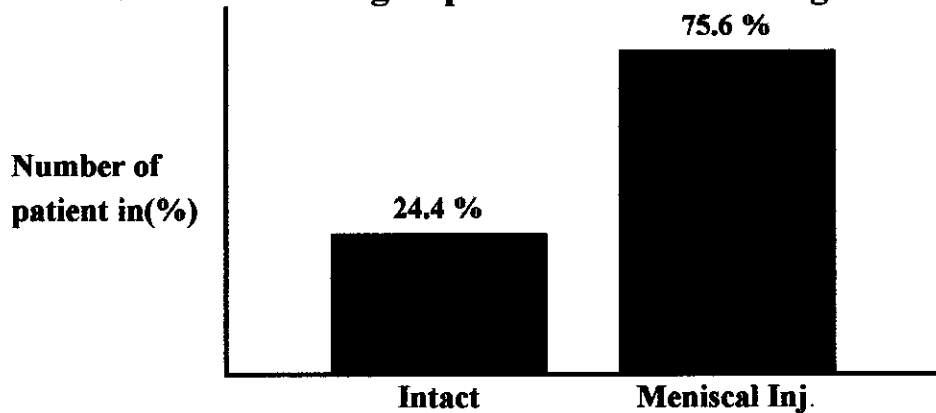
All patients, except for one, had their activity level dropped postmanagement by at least one grade, 44% of the patients had their activity level dropped by 2 grades post management.

	No drop	One level drop	Two level drop	Three level drop
No. of patients	1 (2.5 %)	10 (22 %)	19 (42 %)	15 (33 %)

Preinjury activity level was insignificant in relation to final evaluation grade where postmanagement activity level was significant in relation to final evaluation grade.

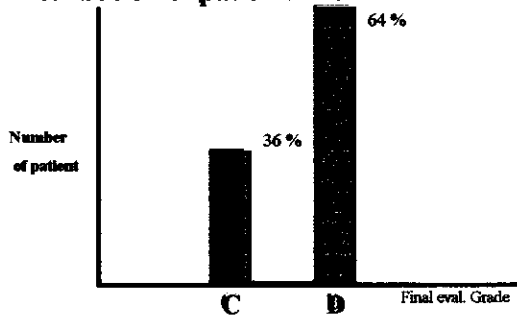
- Meniscal status

### Meniscal status in the group of conservative management

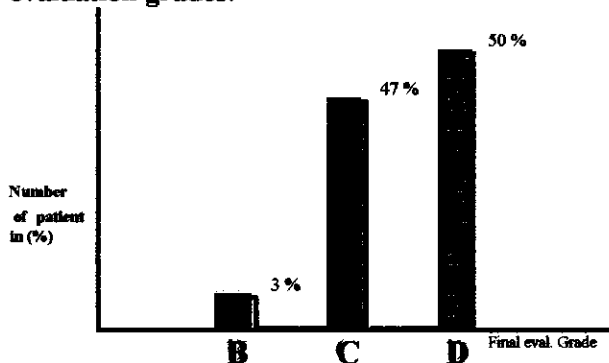


This was insignificant in relation to final evaluation grade.

### Distribution of patients with intact menisci in relation to final evaluation grades.



### Distribution of patients with meniscal surgery (or injury) in relation to final evaluation grades.



-64% of the patients with intact menisci got final evaluation grade D. (7/11)

-50% of the patients with meniscal surgery (or injury) got final evaluation grade D. (17/34)

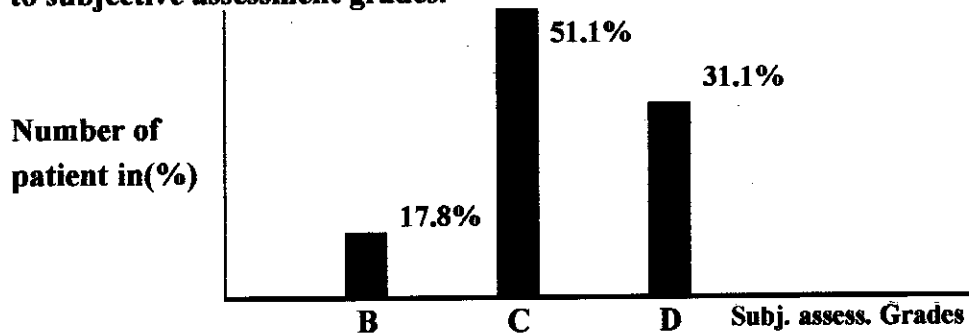
-No patient with intact menisci got final evaluation grade B, whereas one patient with medical meniscectomy got final evaluation grade B.

### Evaluation Section results

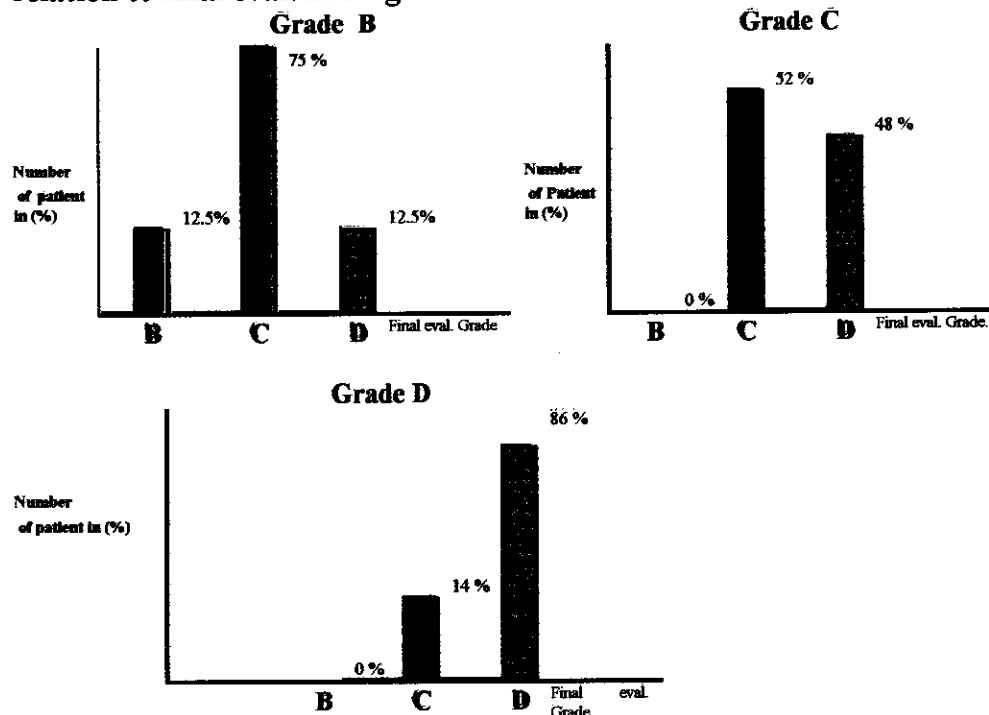
- **Subjective assessment.**

This was highly sensitive in relation to final evaluation grades ( $P=0.0005$ ).

**Distribution of patients in the group of conservative management according to subjective assessment grades.**



- **Distribution of patients with different subjective assessment grades in relation to final evaluation grades.**



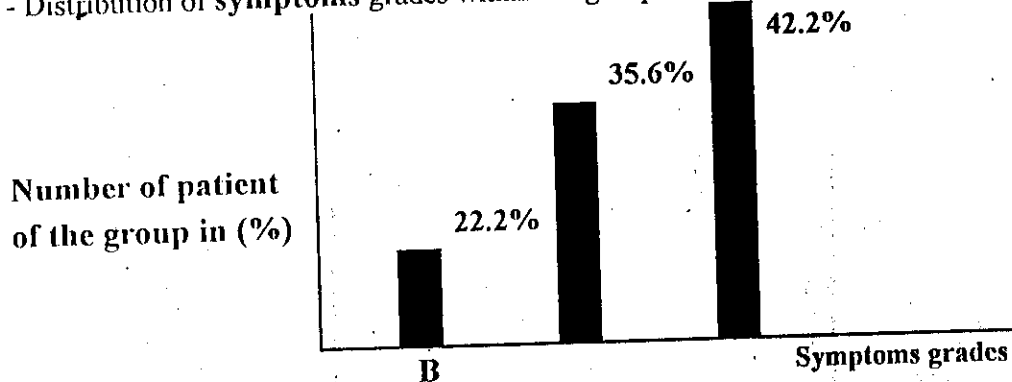
Patients with the better subjective assessment had less the chance to get poor final evaluation grade.

## Results

### • Symptoms

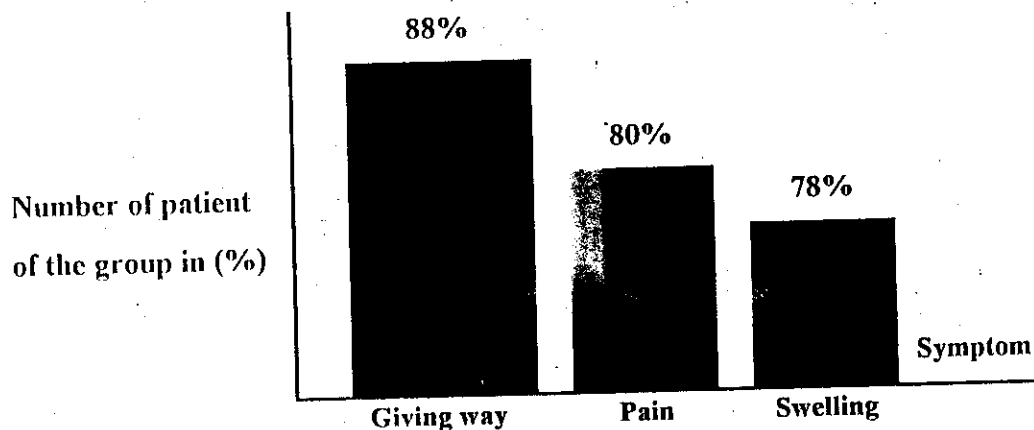
This was very sensitive in relation to final evaluation grade. ( $P=0.0001$ )

- Distribution of symptoms grades within the group of conservative management.



- 22.2% of the patients complained of symptoms after moderate activity, 35.6% complained of symptoms after light activity and 42.2% of the patients complained of symptoms with activity of daily living.

- Frequency of pain, swelling and giving way in the group of conservative management.

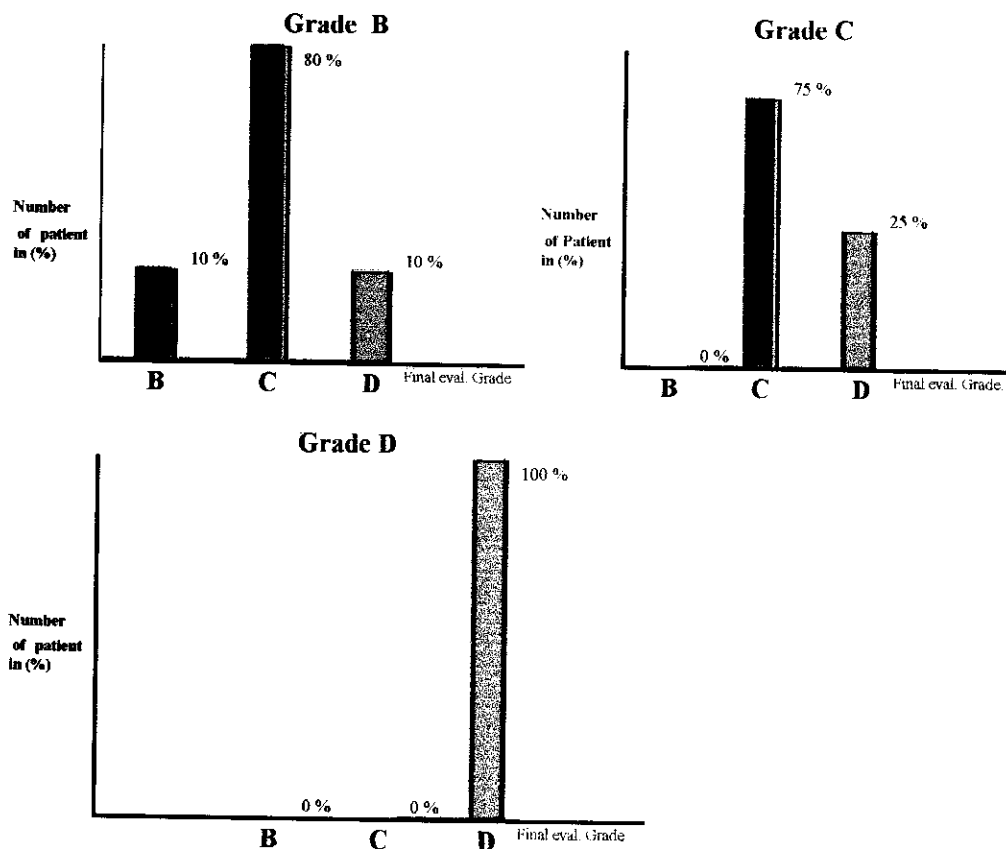


♦ 40 patients complained of giving way, 7 of them had possible medial meniscal injury. 12 patients complained of giving way with strenuous activities, 14 patients complained of giving way with moderate activities and 14 patients complained of giving way with light activities and ADL.

♦ 36 patients complained of pain. 9 (25%) patients complained of pain with strenuous activities. 14 (39%) patients experienced pain with moderate activities and 13 patients used to get knee pain with light activities and their activities were limited to ADL because of pain.

♦35 patients complained of swelling. 23 patients complained of swelling with strenuous activities. 7 patients complained of swelling with moderate activities and 5 patients had their activities limited to ADL because of swelling, even with light activities .

- **Distribution of patients with different symptoms grades in relation to final evaluation grades.**



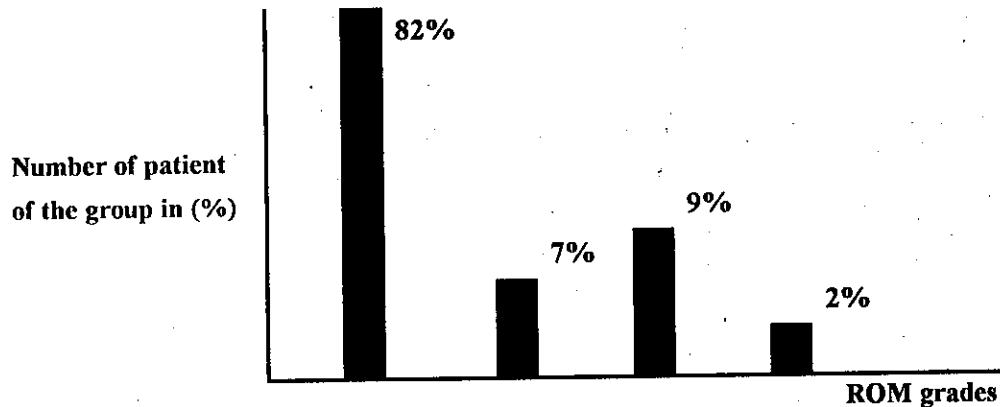
\* Patients with poor symptoms evaluation grade, got poor final evaluation grade.



## Results

- **Range of Motion (ROM)**

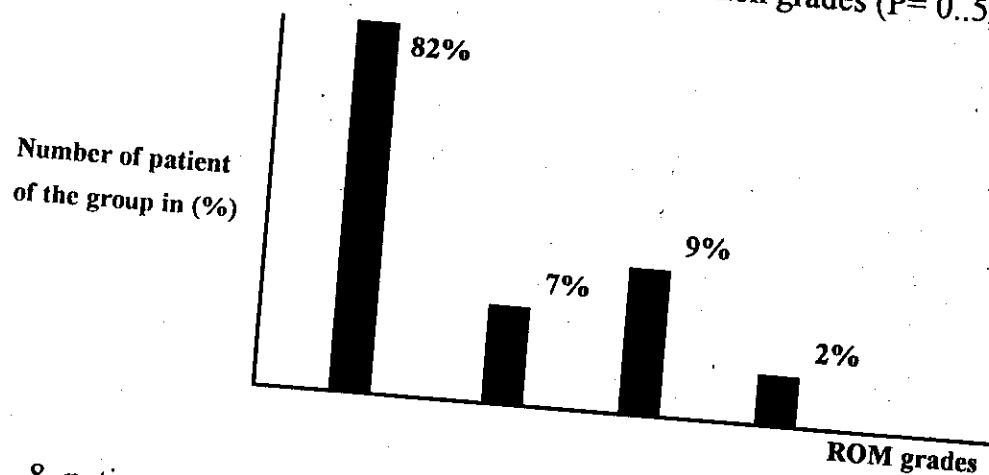
This was insignificant in relation to final evaluation grades ( $P=0.5$ ).



8 patients had range of motion problems. One patient had lack of  $10^\circ$  flexion (B grade). Two patients had lack of  $5^\circ$  extension (grade B). Four patients had lack of both flexion ( $20^\circ$ ) and extension ( $10^\circ$ ) of grade C. And one patient had lack of both flexion ( $30^\circ$ ) and extension ( $10^\circ$  to  $15^\circ$ ) of grade D. 11 patients (24%) had  $5^\circ$  to  $10^\circ$  hyperextension.

- Range of Motion (ROM)

This was insignificant in relation to final evaluation grades ( $P=0.5$ ).

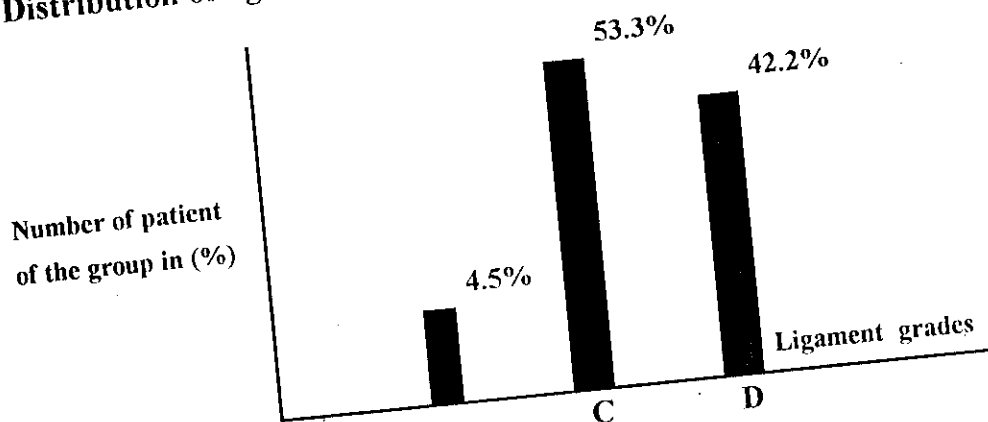


8 patients had range of motion problems. One patient had lack of 10° flexion (B grade). Two patients had lack of 5° extension (grade B). Four patients had lack of both flexion (20°) and extension (10°) of grade C. And one patient had lack of both flexion (30°) and extension (10° to 15°) of grade D. 11 patients (24%) had 5° to 10° hyperextension.

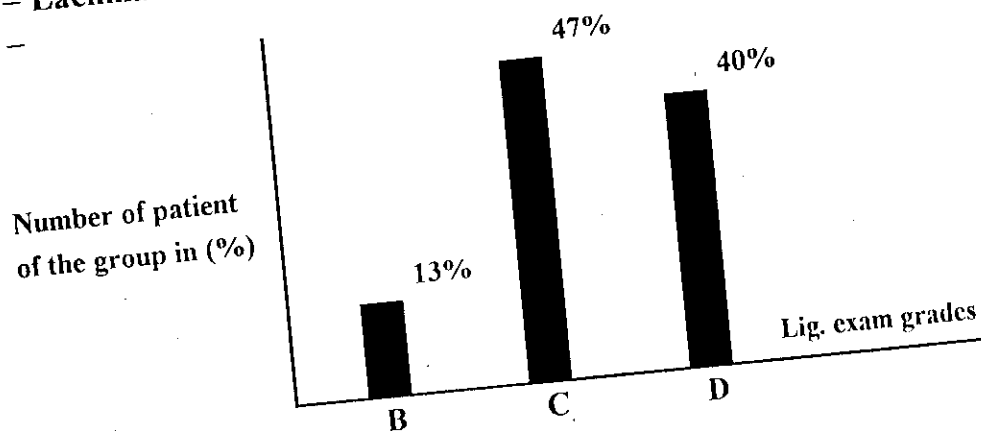
## Results

### • Ligament Examination

Distribution of ligament evaluation grades within the group.



– Lachman test distribution within the group.



6 patients (13%) had manual Lachman test displacement of 5mm (grade B). 21 patients (47%) had manual Lachman test displacement of 6-10mm (grade C), and 18 patients (40%) had manual Lachman test displacement of more than 10mm, all had soft end point.



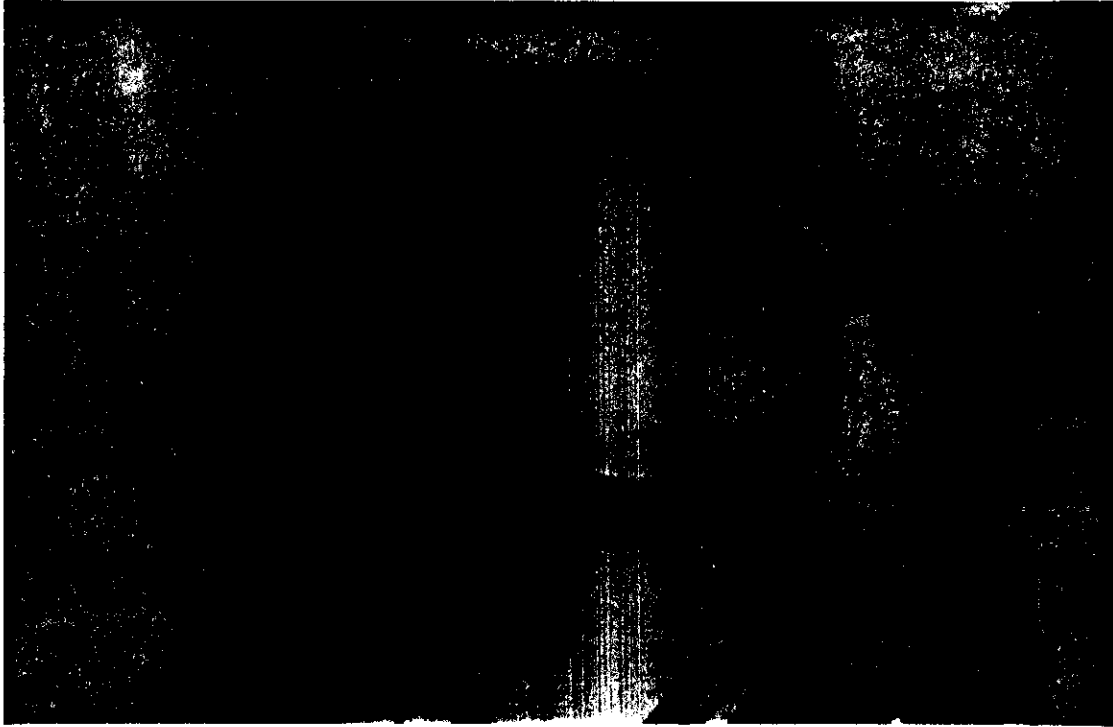
T1 weighted image of a reconstructed knee showing degeneration of posterior horn lateral meniscus .

T1 weighted image showing horizontal tear grade C of posterior horn of medial meniscus .

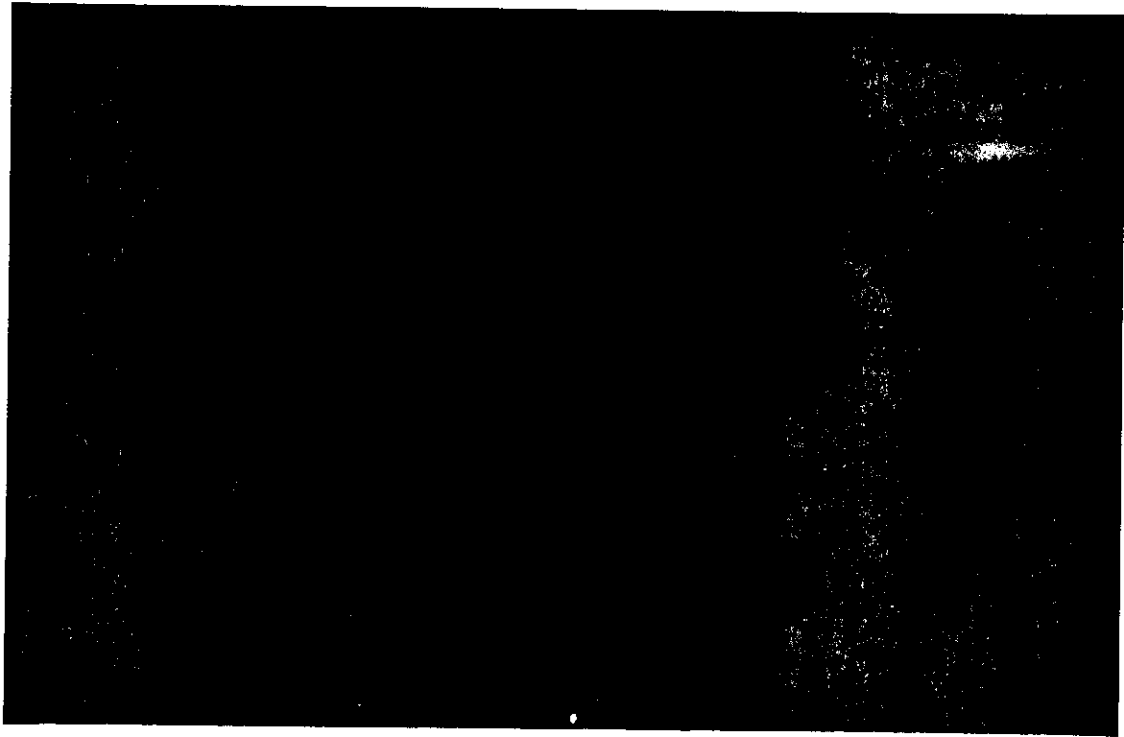


T1 weighted image of a reconstructed knee showing vertical tear of posterior horn of medial meniscus .

T2 weighted image of the previous case showing vertical tear of posterior horn of medial meniscus .



\* T2 weighted image of the same patient .



\* MRI of the knee. T1 weighted image .



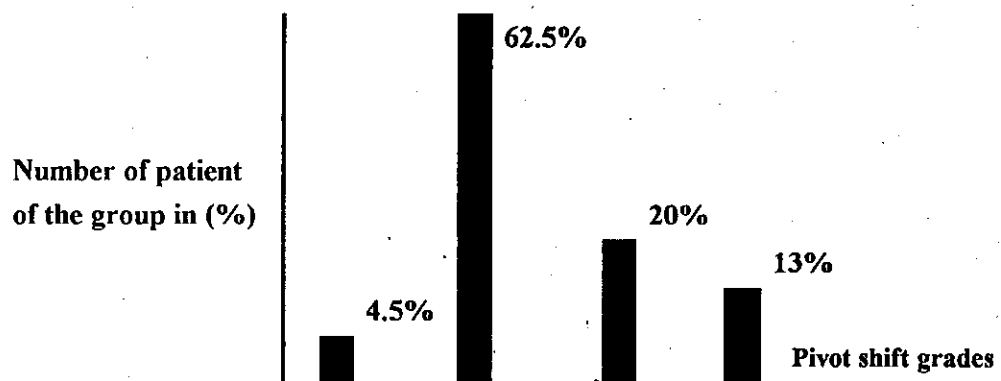
\* T1 weighted image .



**\* Proton density image of the same patient .**

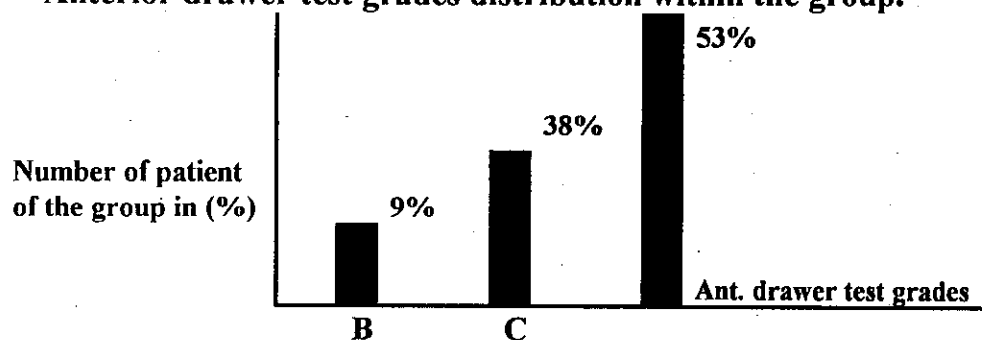
**\*\*\* T1, T2 and proton density image of the knee showing torn ACL and torn posterior horn of the medial meniscus.**

- Pivot shift test grades within the group.



In 2 patients (4.5%) manual pivot shift test could not detected. 28 patients (62.5%) gliding pivot was detected (grade B). In 9 patients (20%) frank pivot shift with clunk was detected (grade C) and in 6 patients (13%) pivot shift was gross (grade D).

- Anterior drawer test grades distribution within the group.



- 4 patients (9%) had manual anterior drawer test displacement of 5mm (grade B). 17 patients (38%) had anterior drawer test displacement more than 5mm and less than 10mm (grade C) and 24 patients (53%) had anterior drawer test displacement more than 10mm (grade D).

- Ligament evaluation grade was highly sensitive in relation to final evaluation grade. ( $P=0.0001$ )

- 2 patients got ligament evaluation grade B., one of them got final evaluation grade B and the other got C.

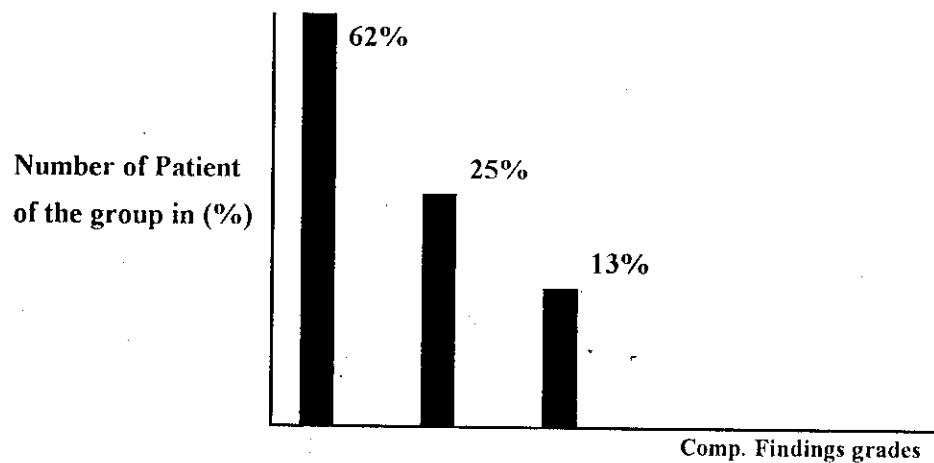
- \*79% of the patients with ligament evaluation grade C. got final evaluation grade D.

- \*All patients with ligament evaluation grade D. got final evaluation grade D.

- **Compartmental findings**

This was insignificant in relation to final evaluation grade. (P= 0.3)

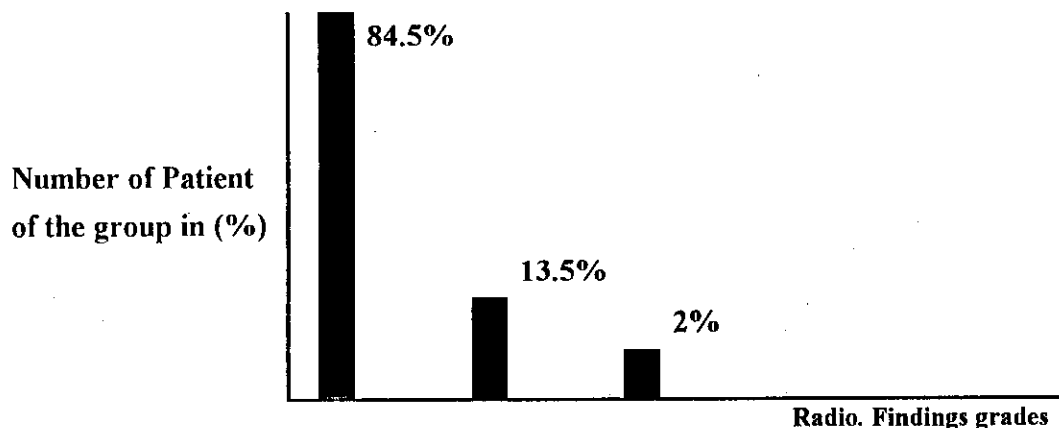
– **Distribution of compartmental findings grades within the group.**



- Radiological findings

This was insignificant in relation to the final evaluation grade.

- Distribution of Radiological findings evaluation grades within the group of conservative management.



38 patients had no radiological changes. 6 patients (84.5%) had no narrowing of the joint space but they had osteophytosis, especially in the medial joint line and in the patellofemoral joint. One patient (2%) had narrowing of the joint space of less than 50% of its width.

84.5% of patients got radiological evaluation grade A. of these patients with grade A. radiological findings, 52.5% got final evaluation grade D, 45% got final evaluation grade B.

- Osteochondritis juvenilis (osgood schlatter's disease) of the tibial tubercle was a finding that may direction the attention to the possibility of neglecting patellar tendon as a source of autogenous graft when reconstruction is considered.

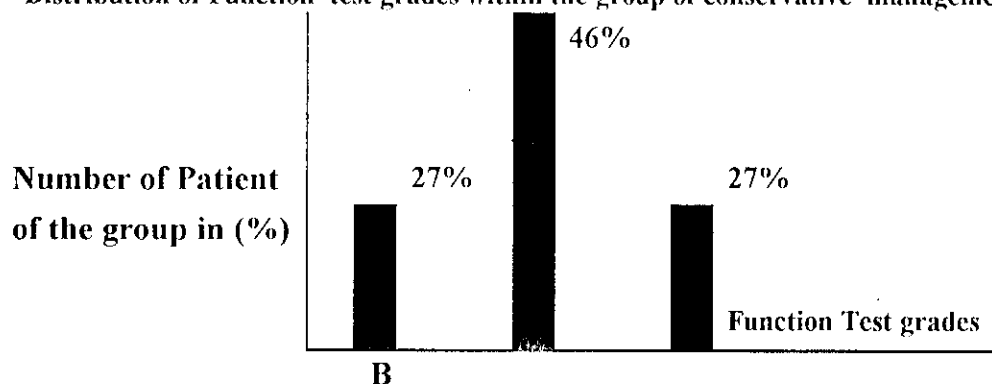
- Intercondylar notch stenosis was not a finding in any case of this group of patients.

- Osteochondritis dissicans of the medial femoral condyle, near the intercondylar notch was a finding in two cases operated upon, where MRI of these 2 cases did not detect the lesion.

- **Function test**

This was highly significant ( $P=0.0001$ )

-Distribution of Function test grades within the group of conservative management.

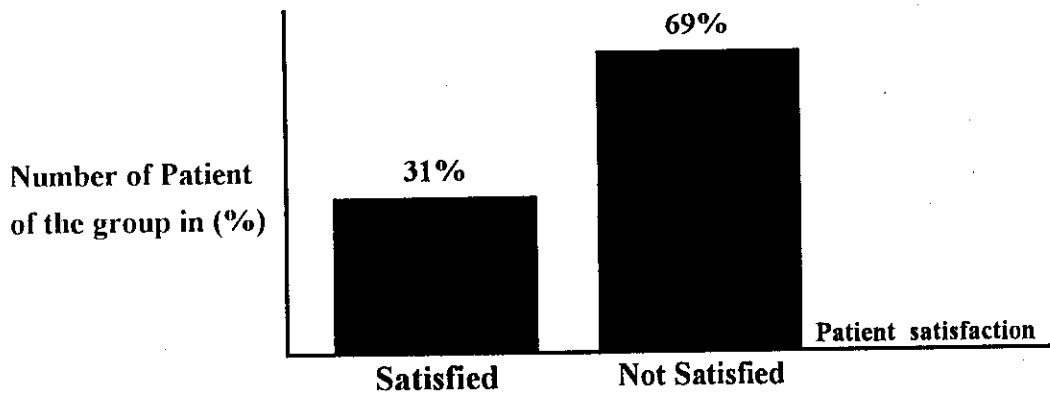


- All patients with D. function test grade got final evaluation grade D.
- Patients with function test grade C.
  - 43% got final evaluation grade C.
  - 57% got final evaluation grade D.
- Patients with function test grade B.
  - 8.5% had final evaluation grade B.
  - 83% had final evaluation grade C.
  - 8.5% had final evaluation grade D.
- No patient had function test grade A.

## Results

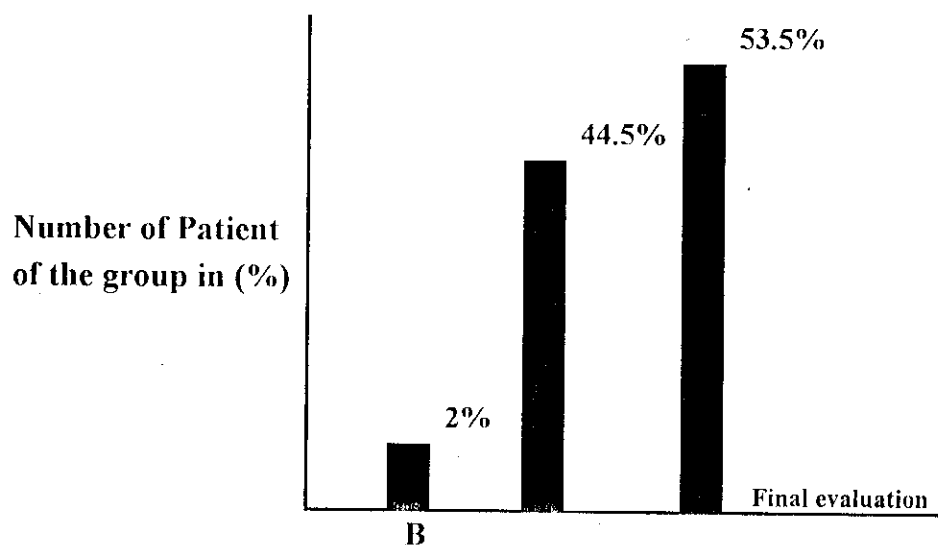
---

### • Patient satisfaction



31% of the patients were satisfied with the final outcome. Many factors contributed to their satisfaction. Some of them were afraid of surgical interference and/or accepted reduction in activity level, rehabilitation program and precautions. Others were satisfied because of medical systemic problems and socio-economic problems. Out of those satisfied patients 8% got D. grade final evaluation, 84% got C. grade final evaluation and 8% got D. grade final evaluation .

### Final evaluation of the group of conservative management.



- Statistical significant factors, influencing the final evaluation.
- Postmanagement activity level .
- Subjective assessment .
- Symptoms grades.
- Ligament examination grade.
- Function Test grade.
- Patient satisfaction.

The following items were examined for statistical significance in relation to final evaluation grade, where all of them were insignificant in the group.

- Muscle power around the knee.
- Follow up period.

## Results

### **Results of the surgical group (Reconstruction group)**

#### **Documentation section results**

- **Age**

The mean age at time of index injury was 18.2 years (range 16.5-31 years). This was insignificant in relation to final evaluation grade. Age at time of reconstruction, mean age 22.1 years (range 17-32 years).

This was significant in relation to final evaluation grade ( $P=0.03$ )

Best results were around the age 23 years with standard deviation (S.D) 4.

Worst results were around the age 18 years with S.D 9.

Good results were in the age group (19-27) years. Less favourable results above the age 28 years. Poor results below 19 years.

- **Injury-reconstruction period**

This was highly significant ( $P=0.002$ )

The best results were around 10 months period from injury to reconstruction. Worst results were noticed in those operated upon about 2½ months after injury.

- **Reconstruction-follow up examination period**

This was insignificant in relation to final evaluation grade.

- **Sex**

This was insignificant in relation to final evaluation grade.

- **Involved knee**

This was insignificant in relation to final evaluation grade.

- **Cause of injury**

This was insignificant in relation to final evaluation grade.

- **Sport**

This was insignificant in relation to final evaluation grade.

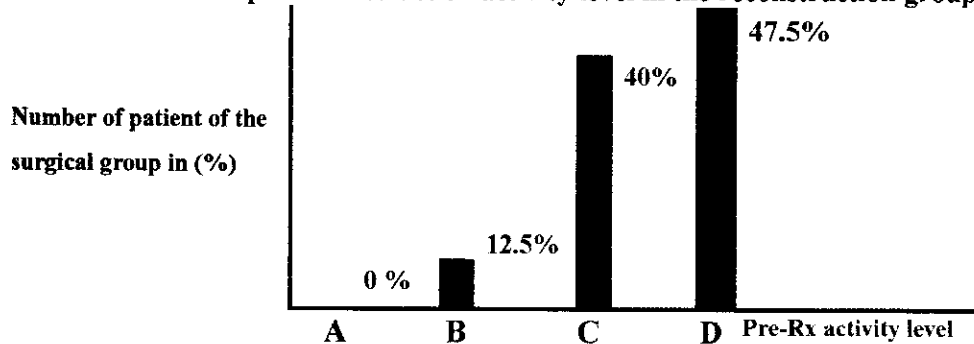
- **Preinjury activity level**

This was insignificant in relation to final evaluation grade.



- Pre-reconstruction activity level:

- Distribution of pre reconstruction activity level in the reconstruction group

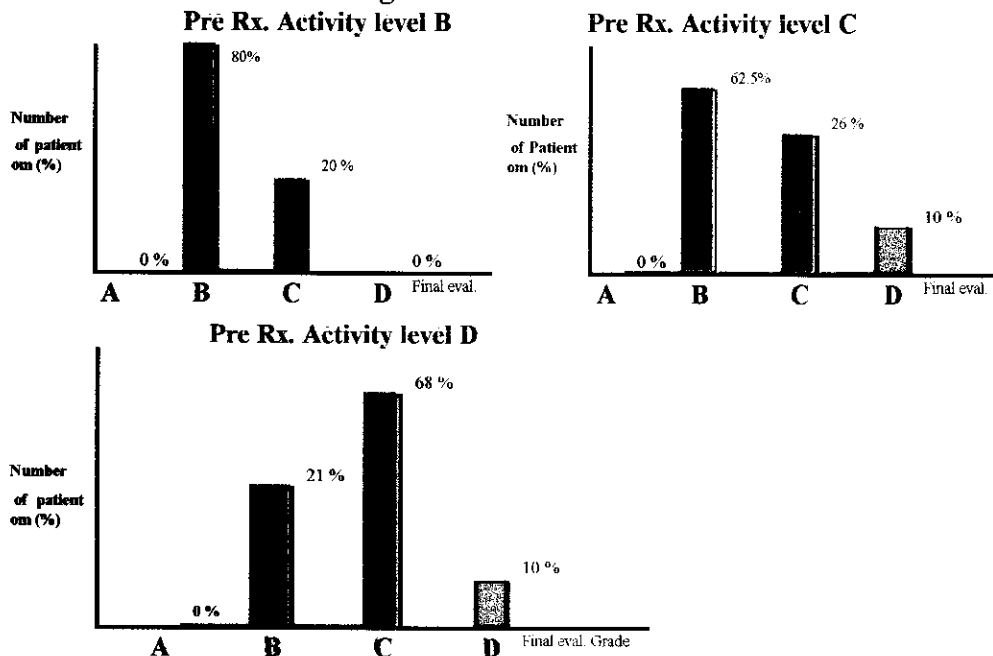


No patient had pre-reconstruction activity level A, 5 patients had pre-reconstruction activity level B, 16 patients had pre-reconstruction activity level C and 19 patients had D.

Patients with better pre-reconstruction activity level had better chance got to get a nearly normal knee. (B final evaluation grade) .

The relationship between pre-construction activity levels (B,C,D) and final evaluation grades was as follows:-

- Distribution of patients with different reconstruction activity levels in relation to final evaluation grades.



The more drop in activity level before reconstruction was associated with less chance to get better final evaluation assessment grade .

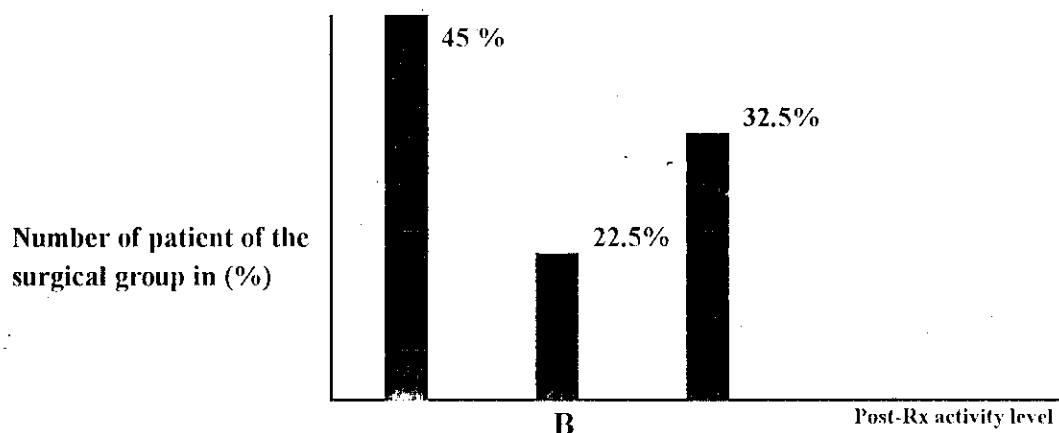
In patients population whom preinjury pre-construction activity level dropped by one grade, 80% of them got a nearly normal knee (final evaluation grade B). Those with 2 grades drop, 62.5% of them got a nearly normal knee (final evaluation grade B) after reconstruction .

## Results

### • Post-reconstruction activity level

This was highly significant in relation to final evaluation grades ( $P=0.0001$ ).

– Post-reconstruction activity level distribution within the group of surgical management.



\* Of the patients had post reconstruction activity level A:

89 % of them got final evaluation grade B.

5.5% of them got final evaluation grade C.

5.5% of them got final evaluation grade D.

– Patients with post-reconstruction activity level B. had the final evaluation grades as follow:-

22 % of them got final evaluation grade B.

66 % of them got final evaluation grade C.

11 % of them got final evaluation grade D.

– Patients with post-reconstruction activity level C. had the final evaluation grades as follow:-

No patient got final evaluation grade B.

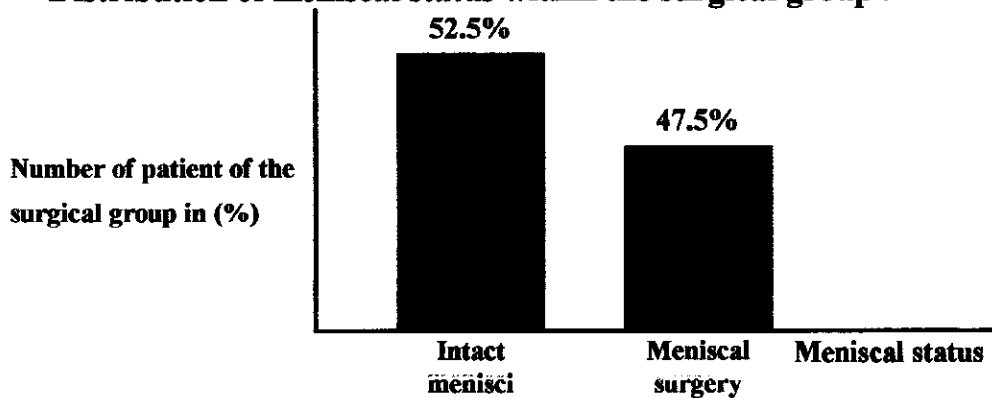
85 % of patients got final evaluation grade C.

15 % of patients got final evaluation grade D.

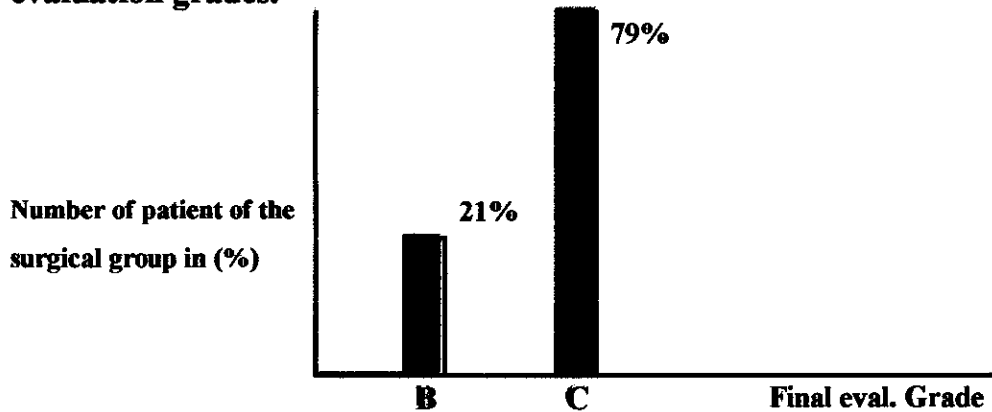
• **Meniscal status**

This factor was highly significant in relation to the final evaluation grade (P= 0.0002)

\* **Distribution of meniscal status within the surgical group .**



-**Distribution of patients with meniscal surgery in relation to final evaluation grades.**

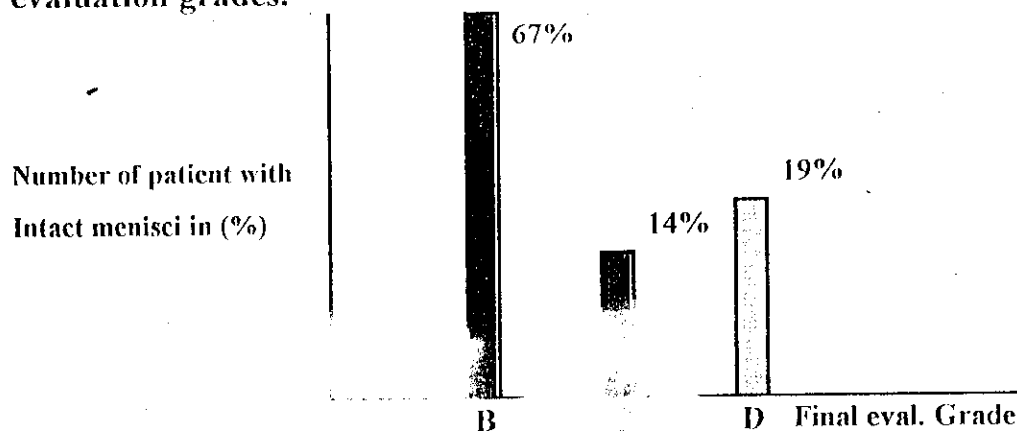


♦ **Meniscal procedures in the reconstruction group.**

- \* 2 patients had medial and lateral menisctomies.
- \* 9 patients had medial menisctomies (3 arthroscopic and 6 by open arthrotomy).
- \* 5 patients had lateral menisctomies (2 arthroscopic and 3 by open arthrotomy).
- \* 3 patients had medial meniscal injuries .

## Results

— Distribution of patients with intact menisci in relation to final evaluation grades.



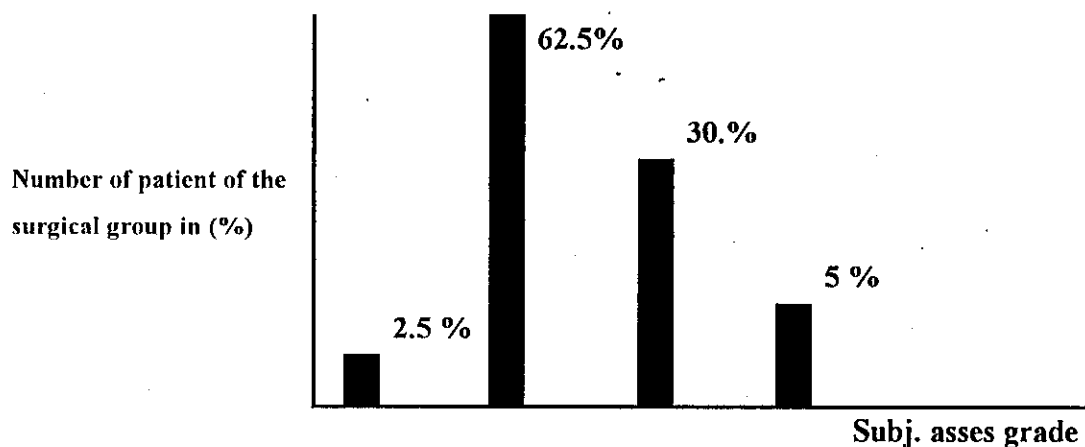
Patients with intact menisci got better chance to have a nearly normal knee (final evaluation grade) than patient with meniscal surgery or injury .

### Evaluation Section results

#### •Subjective assessment

This factor was highly significant in relation to final evaluation grade ( $P=0.0001$ ).

Frequency of distribution of subjective assessment grades within the group.



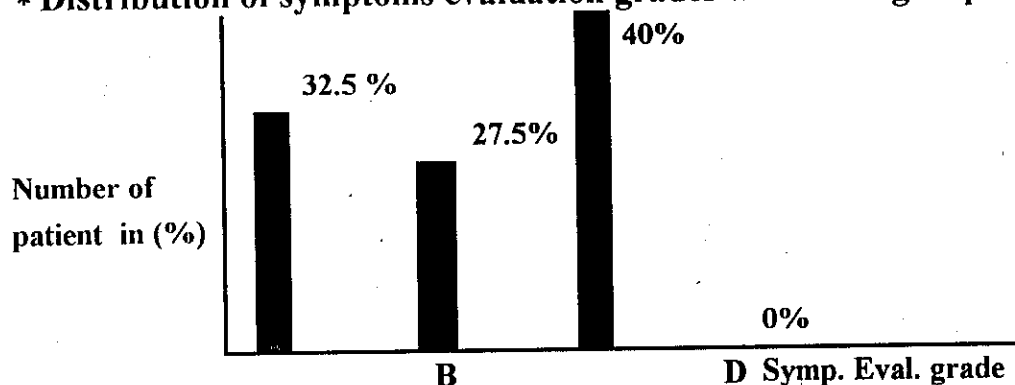
Patients with normal or nearly normal subjective evaluation had better chance to have nearly normal knee (final evaluation grade).

## Results

### • Symptoms

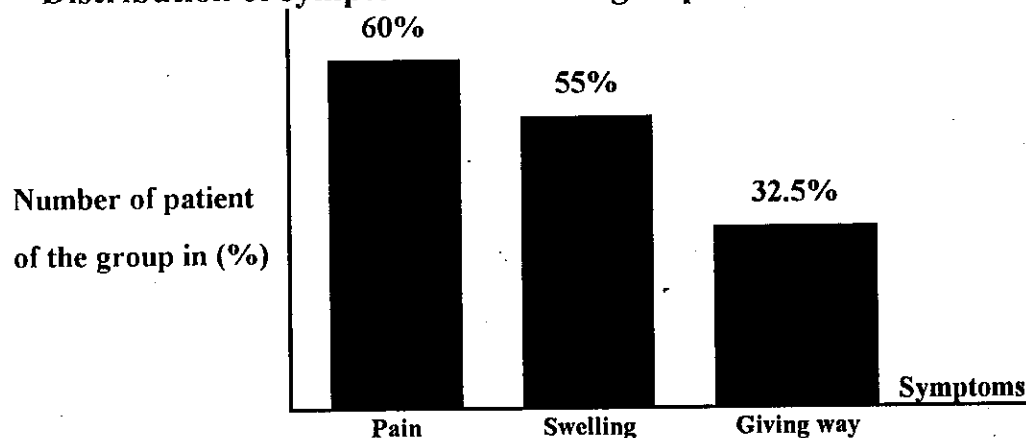
This was highly significant in relation to final evaluation grades ( $P = 0.0001$ )

#### \* Distribution of symptoms evaluation grades within the group.



32.5% had no symptoms after strenuous activity, 27.5% had no symptoms after moderate activity and 40% had no symptoms after light activity.

#### – Distribution of symptoms within the group.



The main symptom was pain.

- 40% of patients had no pain complain. 10 patients (25%) had pain with strenuous activity (evaluated as B grade). 14 patients (35%) complained of pain with moderate activities (heavy manual work), so they got the evaluation grade C, no patient had pain with moderate or light activities.
- 22 patients complained of swelling. 13 patients (32.5%) had no swelling after moderate activities, so they got swelling evaluation grade C.
- 27 patients were not complaining of giving way (67.5%). 5 patients (12.5%) complained of giving way with strenuous activity, so they got giving way

## *Results*

---

evaluation grade B. 8 patients (20%) complained of giving way with moderate activities (got evaluation grade C). No patient had giving way symptom with light activities.

– Patients with normal or nearly normal symptoms grade had better chance to have a nearly normal knee (final evaluation grade).

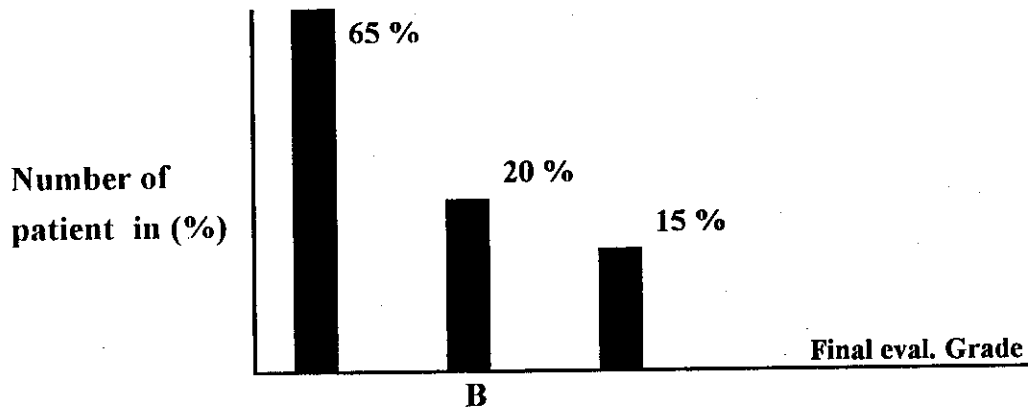


## Results

---

### • Range of motion (ROM)

This was not sensitive in relation to final evaluation grade (insignificant).

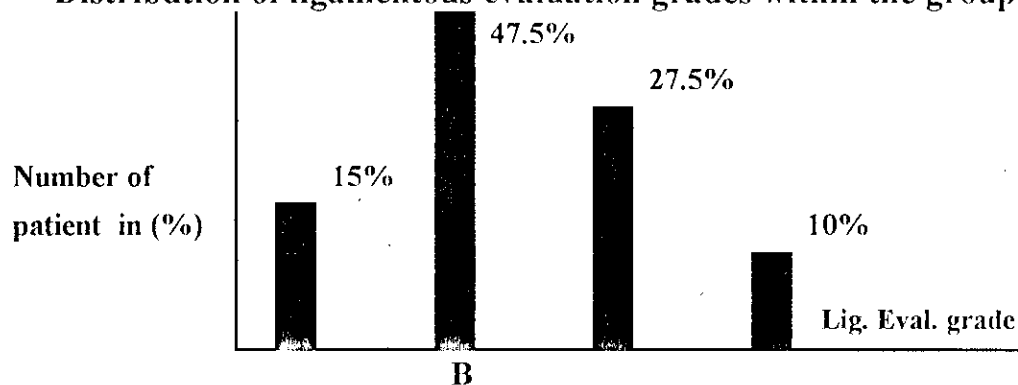


- 26 patients had no range of motion limitations. 4 patients out of them had 5° hyperextension and were evaluated as A grade .
- 8 patients had range losses of grade B (3°-5° extension range lack and/or 5°-15° flexion range lack) .
- 5 patients had only flexion range losses .
- 2 patients had only extension range losses .
- 1 patient had both flexion and extension range losses .
- 6 patients had grade C range problems (6°-10° extension range loss and/or 15°-25° flexion range loss) .
- 3 patients had extension range losses. One patient had flexion range losses. 2 patients had both flexion and extension range losses .

- **Ligament Examination**

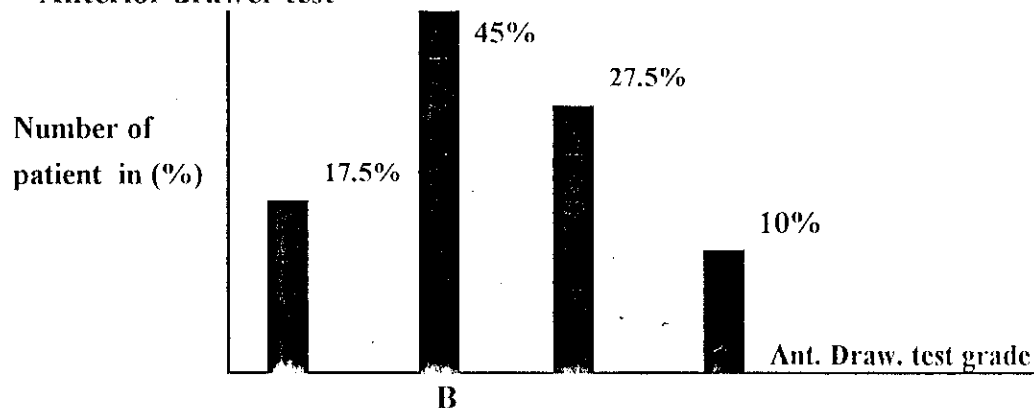
This was a highly sensitive factor in relation to final evaluation grade ( $P=0.001$ ).

- \* **Distribution of ligamentous evaluation grades within the group.**



- **Distribution of laxity tests within the surgical group.**

- **Anterior drawer test**



- 7 patients (17.5%) had less than 3mm total anterior tibial displacement on manual anterior drawer test. 18 patients (45%) had 3 to 5mm anterior tibial translation (grade B).

- 11 patients (27.5%) of the group had total anterior tibial translation at 70° flexion, by manual examination from 6 to 10mm, and 4 patients (10%) had more than 10mm anterior tibial translation. i.e. 37.5% of the patients had abnormal and severely abnormal anterior tibial translation at 70° flexion.

**\* T2 weighted image of the same patient .**

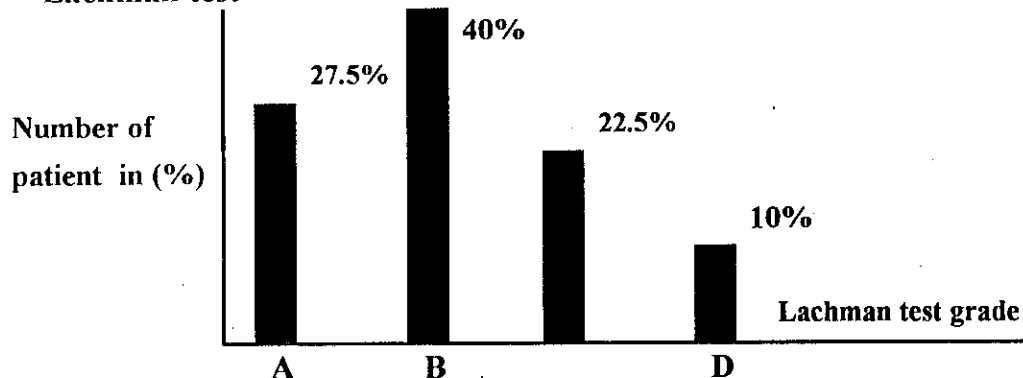


**\* Proton density weighted images of the same patient .**

**\*\*\* T1, T2 and proton density weighted images of a reconstructed knee showing stretching, partially torn ACL graft and torn posterior horn lateral meniscus .**



## – Lachman test

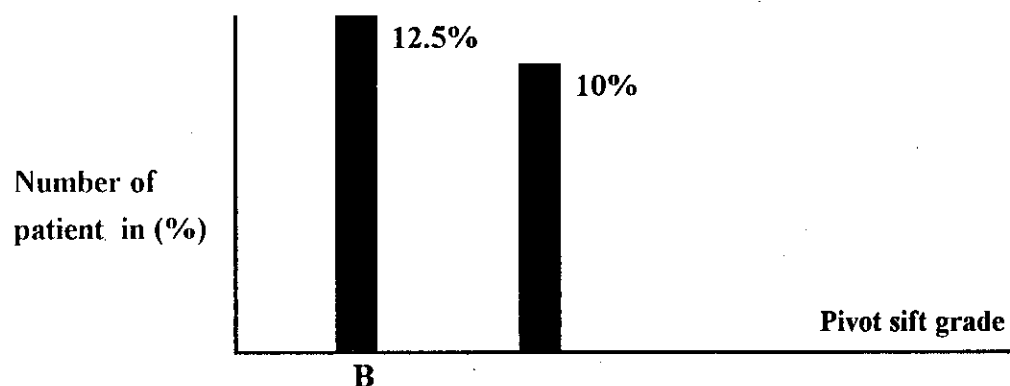


–27 patients (67.5%) had normal lachman test at 25° less than 5mm with firm end point.

–9 patients (22.5%) of the patients had Lachman test laxity (as 25° flexion) of more than 5mm on manual examination, and 4 patients (10%) had laxity of more than 10mm, both had soft end point. i.e. 32.5% of the patients of this group had Lachman laxity of more than 5mm with soft end point.

2 patients (5%) had Lachman laxity less than 5mm with firm end point. but they had anterior drawer laxity of more than 5mm and less than 10mm.

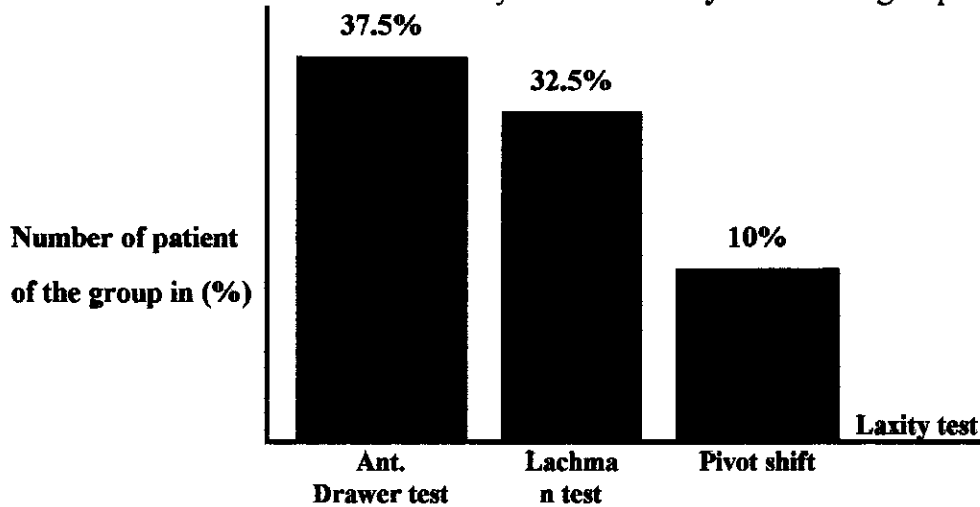
## – Pivot shift test



## Results

93  
92

- Distribution of abnormal and severely abnormal **laxity tests** in the group.



- Distribution of patients with different ligament evaluation grades in relation to final evaluation grades.

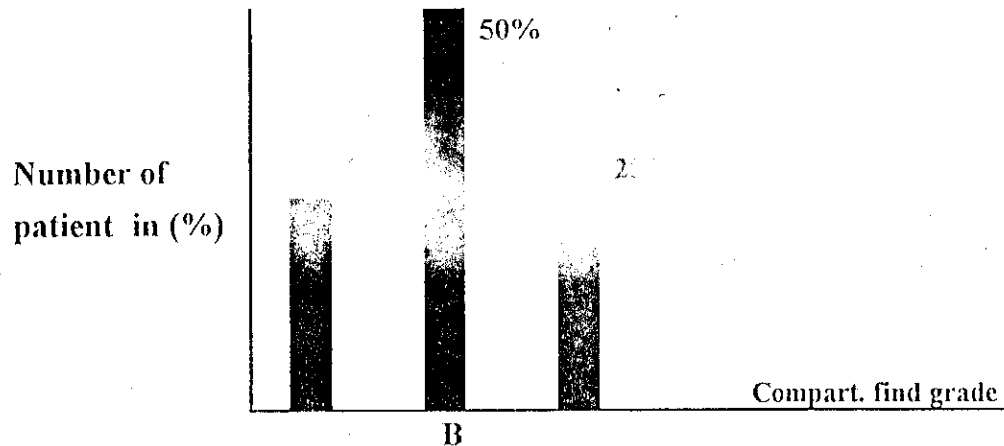
Ligament evaluation grades	Final evaluation grades			
		A	B	C
	A		50%	50%
	B		79%	21%
	C			100%
	D			100%

All patients with ligament evaluation grades C&D, got final evaluation grade D. 50% and 79% of patients with ligament evaluation grades A&B, got final evaluation grade B.



- **Compartmental findings**

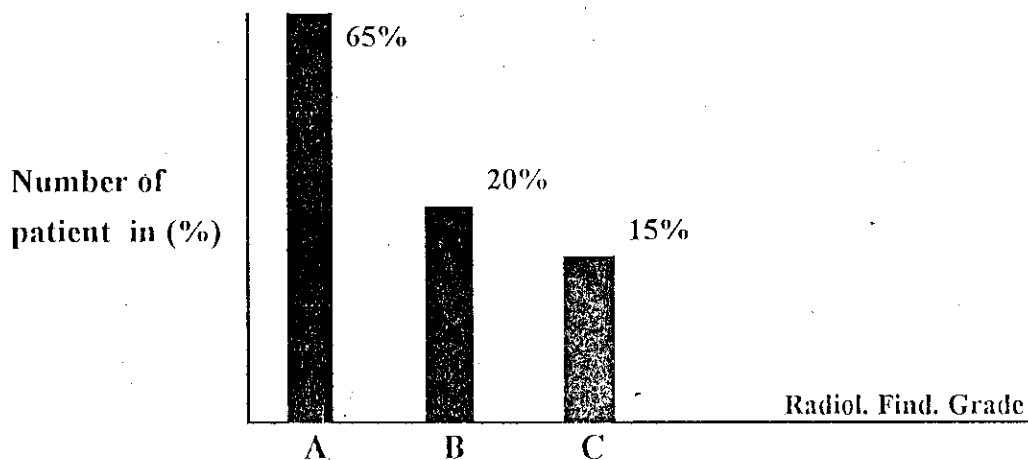
Compartmental findings were not significant in relation to final evaluation grades.



- **Radiological findings**

These findings were significantly related to final evaluation grades ( $P=0.05$ )

- **Distribution of radiological findings grades within the surgical group.**

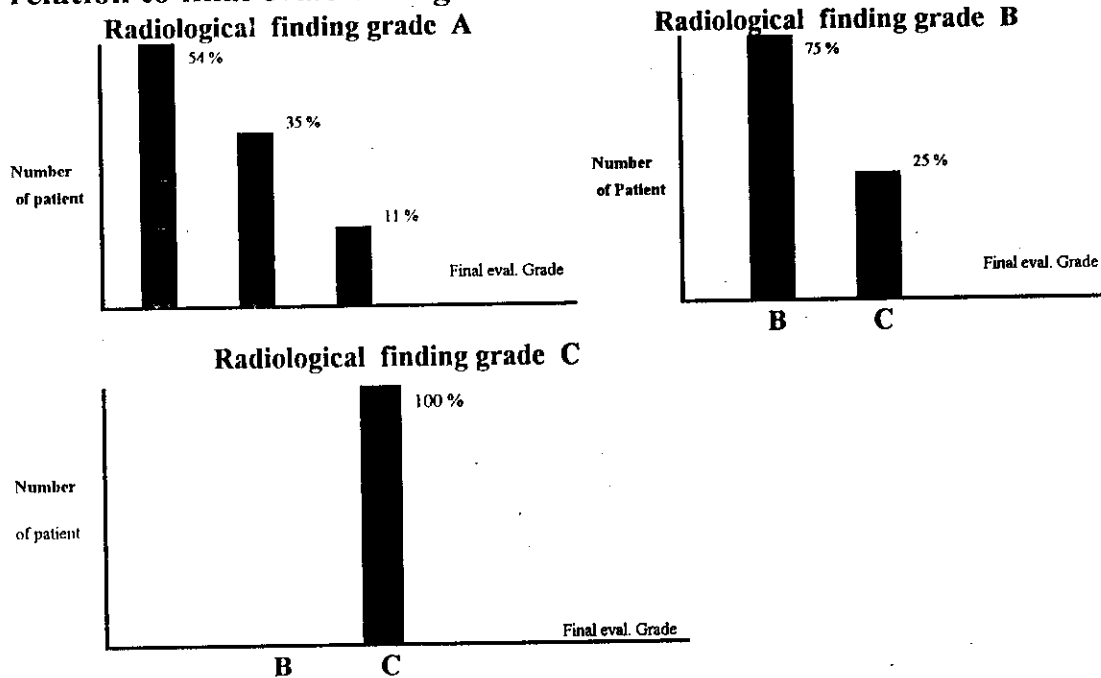


Patients with bad radiological evaluation grade got poor final evaluation grade.

AP and lateral view of a reconstructed stable knee showing grade C radiological changes .

## Results

**Distribution of patients with different radiological findings grades in relation to final evaluation grades.**

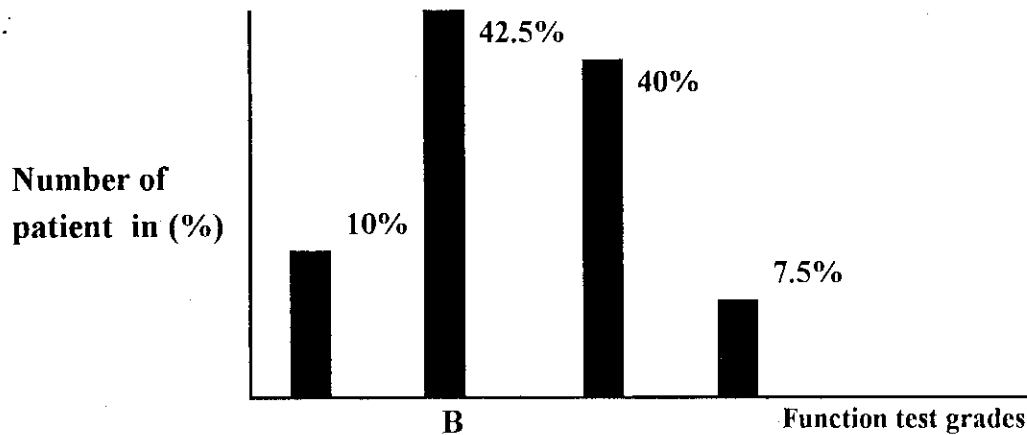


- 54% of patients with radiological findings grade A, got final evaluation grade A.
- Patients with radiological findings grade B, 75% of them got final evaluation grade B, and 25% of them had final evaluation grade C.
- All patients with radiological finding evaluation grades C, had final evaluation grade C.
- Radiological findings were more frequent in patients with meniscal surgery
- Joint space narrowing was evaluated according to the IKDC scale, but other radiological changes that are not evaluated by IKDC form were graded B, when these changes were unilateral affecting the reconstructed knee. (tibial osteophytosis, squaring of the femoral condyles).
- Changes were mainly osteosclerotic.
- Not only degenerative changes were evaluated radiologically, but notch graft impingement, graft stretching, metal failure and intra articular ossification were also diagnosed radiologically by plain X Rays and MRI examination.
- Intercondylar notch evaluation by tunnel view X Ray did not detect notch stenosis nor osteophytosis in the group.

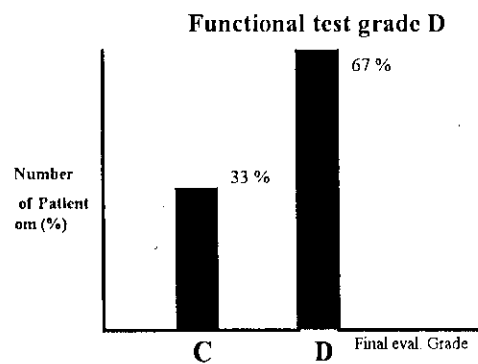
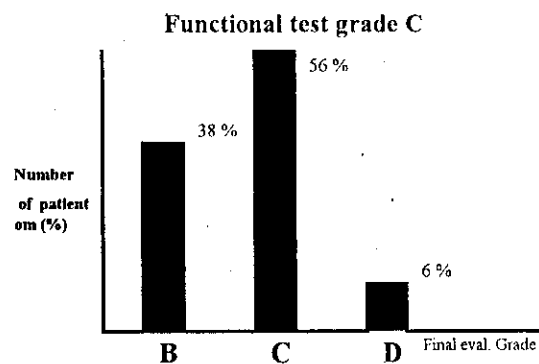
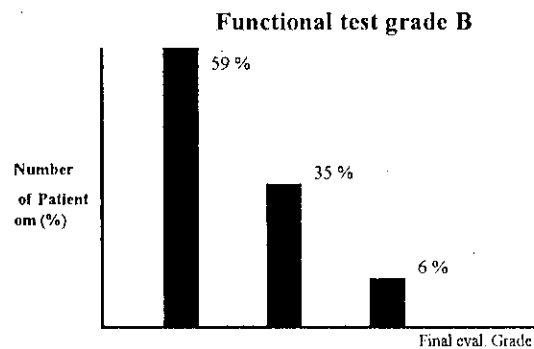
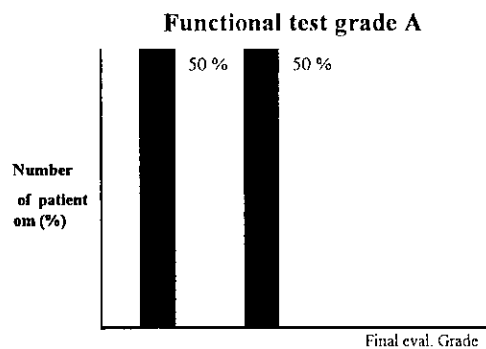
### • Function Test

Function Test evaluation was significant in relation to final evaluation grades ( $P=0.03$ ).

– Function test grades distribution within the group.

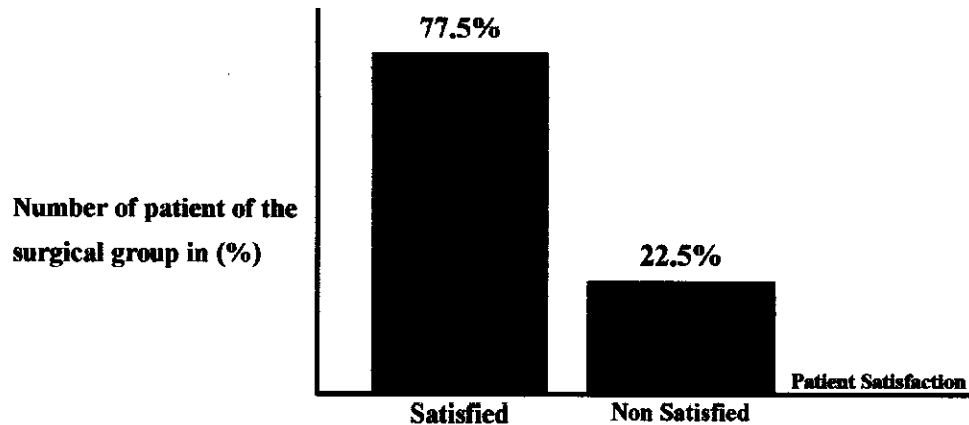


– Distribution of patients with different functional test grades in relation to final evaluation grades.



• **Patient Satisfaction**

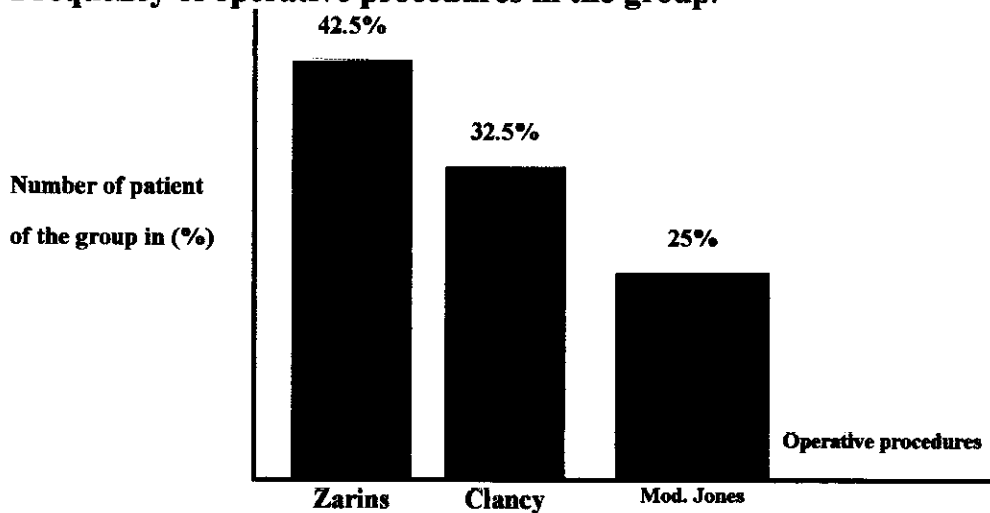
This was highly sensitive parameter in relation to final evaluation grade.



– Distribution of satisfied and non satisfied patients in relation to final evaluation grades.

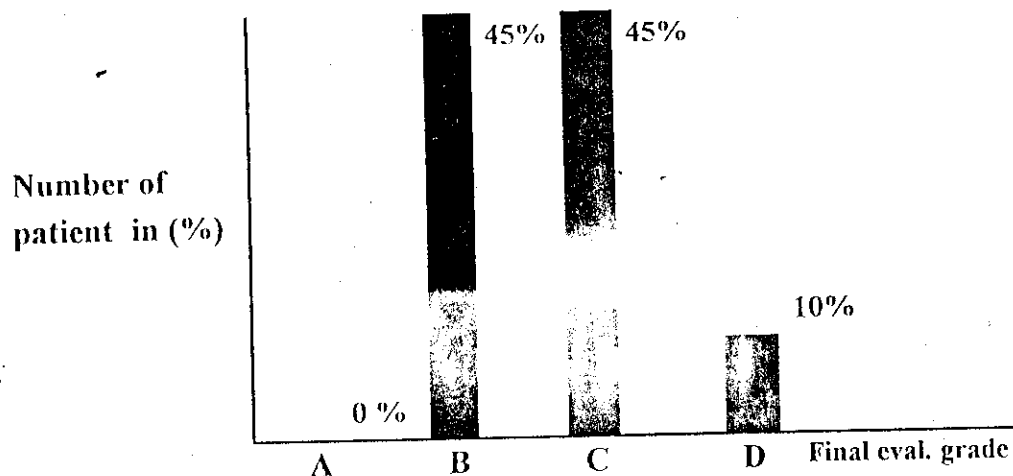
	Final evaluation grades			
	A	B	C	D
Satisfied		58%	42%	
Non satisfied			56%	44%

Frequency of operative procedures in the group.



## Results

### •Final evaluation of the surgical group.



Patient with normal knee	0 %
Patient with nearly normal knee	45 %
Patient with abnormal knee	45 %
Patient with severely abnormal knee	10 %

Statistically significant parameters influencing the final evaluation grades in the surgically managed group were:

- Age at reconstruction.
- Injury - reconstruction period.
- pre-construction activity level.
- Post reconstruction activity level.
- Subjective assessment.
- Symptoms evaluation grade .
- Ligaments evaluation grade .
- Radiological findings evaluation grades .
- Function test evaluation grade
- Associated meniscal surgery.