

## Co-relative Study of Clinical, Laxometry and Arthroscopic Findings in ACL Deficient Knee Joints

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### Introduction

Diagnosis of soft tissues injuries in and about the knee joint is a challenging problem. Physical examination during initial evaluation are essential but not exact in accessing an accurate clinical diagnosis.

The term "IDK" (Internal Derangement of Knee) was originally coined by William Hey (1784) (1). It is broadly used to describe the abnormalities of knee functions due to any cause but mostly traumatic.

In acute stages following injury to the knee, patient is in agony with severe pain and swelling which makes it highly improper to subject the patient to various clinical tests to come to clinical diagnosis. At this time MRI is a preferred modality of investigations but MRI considered to be sensitive to menisci and less sensitive to ACL injuries (7, 8, 9).

Maximum saggital displacement occurs with knee flexed at 20-30° (Markoff, Mensch, Amstuz, 1976).

If we took Laxometry X-rays at this position and if these X-ray shows laxity, that helps the surgeon to plan for reconstructive surgery.

### Aims and Objectives

To document objectively the effectiveness of this method of assessing the saggital laxity of ACL deficient knees.

To compare the Laxometry and Arthroscopic findings in ACL deficient knee.

### Reivew of Leterature

Several new clinical tests to improve our diagnosis of saggital instability have been developed

and attempts have been made to measure the displacement (1).

(1) *Hughston etal 1976, Slocum et al 1976, Galway & M-intosh*

In 1980 most of these clinical methods have been largely unsuccessful, however, because of the difficulty in determining the degree of instability of accurately.

"Gony laxometers" (Jacobsen 1981) have been used to try & overcome this difficulty but have their own errors, mainly due to soft tissue movement.

The most reliable and reproducible assessments of saggital laxity to date have been by radiographic methods (2).

(2) *Kennedy & Fowler 1971, Jacobsen 1976, Leven 1977, 1978 Mc Phee & fraser 1980, 81. Jacobsen 1981.*

All of theses have involved the use of gonylaxometer to stress the knee before radiological examination, but the size, expense & relatively clumsy nature of gonylaxometer restricts its clinical usefulness.

KT - 1000 & other orthrometer measure-ments are unreliable & have no correlation with clinical symptoms and activity level (3).

(3) *Forester etal JBJS (B) 1989, 71B Harter etal AMJ sports Medicine 1988:16*

### ★ Materials and Methods ★

#### Materials

26 patients who were received to the out patient department over a duration of three months from 5<sup>th</sup> September 2006 to 4<sup>th</sup> December 2006.

The age groups of this patient ranges from 15 years to 50 years. These were 25 males only.

All patients are chronically injured and having ACL deficient knees.

## Methods

### Method of doing laxometry measurement :

#### Material Used :

- ❖ Bohler Braun Splint.
- ❖ Three Velcros straps
- ❖ Weight.
- ❖ Rope with hooks.

Here weight used is  $1/10^{\text{th}}$  of body weight of the patient.  $1/10^{\text{th}}$  of body weight selected because ligaments of joints tolerate this much amount of weight without any discomfort.

#### Procedure

Patients position supine on X-ray table with affected limb on Bohler-Braun splint with knee joint exactly at angle of the splint and patella facing towards ceiling.

Apply one strap exactly at supracondylar region over the femur to fix the femur.

And the second strap at the level of tibial tuberosity for application of hook through which weight are applied as shown in figure parallel to joint line.

Another strap applied at ankle joint to fixed the lower end tibia.

Lateral x-ray were taken first without application of weight and then with application of weight as shown in Fig. 1 & Fig. 2.

Laxity measured on x-ray films.

These straps were used for stress x-ray only and applied while starting the procedure to avoid error in position of limbs.

#### Measurement of Laxity on X-ray films :

Reference line drawn from posterior cortex of the femur and extend downward over the tibia.

Second reference line taken posterior most part of upper end of tibia.

Distance between two lines measured with scale on both x-rays.

The difference between two measurement is the saggital laxity present in joint.

The positive of laxity measurement taken according to IKDC gradings.

6-10 mm laxity indicates definite ACL tear and more than 10mm laxity indicates definite ACL tear with posterolateral corner injury.

The single specialist surgeon performed all Arthroscopic procedure in these patients. Arthroscopic findings in all these cases were recorded.

Then Laxometry findings and Arthroscopy findings compared and analyzed.

### ★ Methods of Taking Laxometry X-rays ★

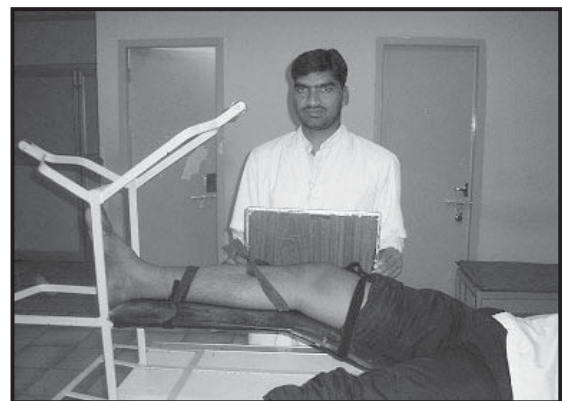


Fig. 1 : Position of the patient and limb for lateral X-ray of knee joint without weight.



Fig. 2 : Position of the patient & limb for lateral X-ray of knee joint with weight.

Position of X-ray picture tube at 1m distance from knee joint.

❖ **Laxometry X-rays** ❖



**Fig. 3A : Without weight.**



**Fig. 3B : With weight.**

Figure 3 radio graph of left knee showing femoro tibial relation ship.

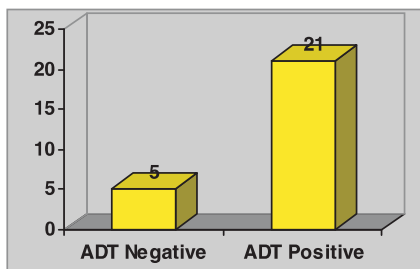
Distance between  $A_1$  and B measured and distance between  $B^1$  and  $A_1^1$  measured. The difference between two measurement is the laxity present in the joint.

True positive result + true negative results/ total number of patientsx 100.

**\* Observations \***

**Clinical Findings**

**Findings of ACL Laxity By Ant. Drawer Test**

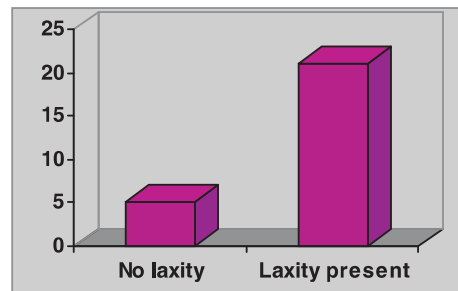


**Table 4 : Findings of ACL laxity by Ant. Drawer Test.**

ADT Negative	ADT Positive
5	21

**Laxometry Findings**

**Laxometry Findings of ACL Deficient Knees**

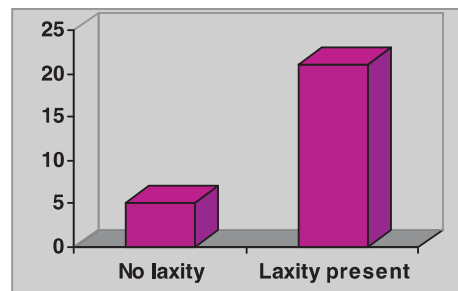


**Table 5 : Laxometry findings of ACL deficient Knees.**

No Laxity	Laxity Present
5	21

**Arthroscopy Findings**

**Laxometry Findings of ACL Deficient Knees**

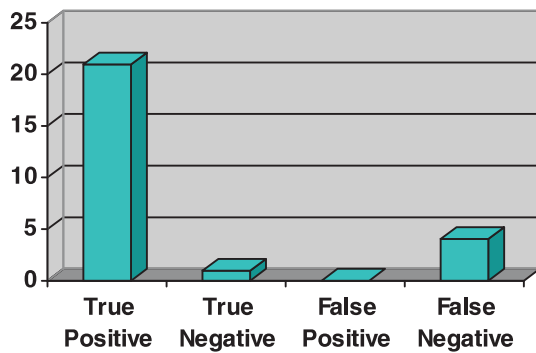


**Table 6 : Findings of ACL on Arthroscopy.**

Not Tear	Tear
1	25

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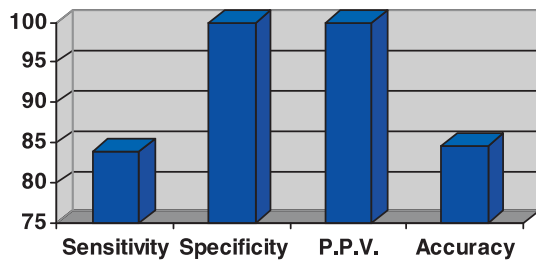
**Comparison Of Laxometry Findings With Arthroscopy Findings**



**Table 7 :**

True Positive	21
True Negative	1
False Positive	0
False Negative	4

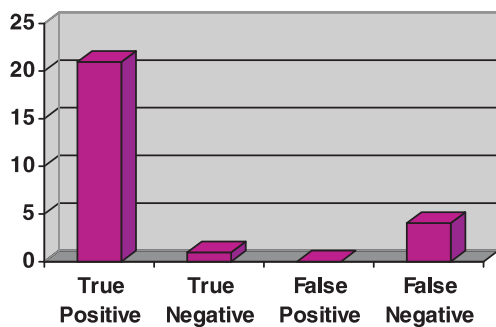
**Laxometry Vs Arthroscopy**



**Table 8 :**

Sensitivity	84
Specificity	100
Positive Predictable Value	100
Accuracy	84.6

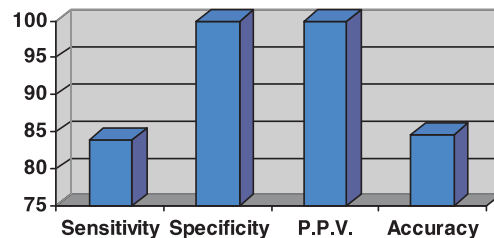
**Comparison of Clinical Findings With Arthroscopy Findings**



**Table 9 :**

True Positive	21
True Negative	1
False Positive	0
False Negative	4

**Clinical Vs Arthroscopy**



**Table 10 :**

Sensitivity	84
Specificity	100
Positive Predictable Value	100
Accuracy	84.6

**\* Summary \***

The high positive predictive value and accuracy in detecting ACL tear help the surgeon in being able to plan and discuss their surgical alternatives with the patient before procedure and definitive surgical procedure is performed at the time of Arthroscopic examination itself.

We got some false negative results during our study. Some of these patients were apprehensive, and with hamstring muscles spasm. Some of them showed on Arthroscopy locked bucket handle meniscus tear.

**\* Conclusion \***

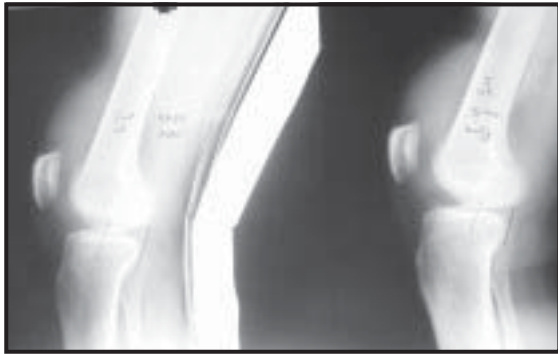
- ❖ Laxometry Radiology method is inexpensive, easy to perform and comfortable for the patients.
- ❖ The surgeon obtains the permanent quantitative assessment of saggital laxity.
- ❖ This information supplements the clinical data, helping initially with diagnosis and later in planning of suitable reconstructive procedure.
- ❖ As it is a permanent documentation useful for follow up studies.

### Master Chart

Name	Age	Sex	Reg No	Arthroscopy	Laxometry Finding
N. VenkataRamaiah	32	M	200608453	Complete ACL tear	7 mm
S. Gangadhar	31	M	20061101829	Complete ACL tear	9 mm
M. K Saimuddin	37	M	200608188	Complete ACL tear	15 mm
Srinivas Rao	33	M	200609791	Complete ACL tear	10 mm
P. Yadagiri	37	M	200609689	Complete ACL tear	12 mm
Y. Suhas Rao	18	M	200609471	Complete ACL tear	11 mm
M. Narsaiah	25	M	200608053	Complete ACL tear	12 mm
K. Srikant	28	M	200608110	Complete ACL tear	11 mm
P. Raja Reddy	42	M	20061013942	Complete ACL tear	10 mm
Ramesh Babu	48	M	20061100231	Complete ACL tear	13 mm
Babu Rao	48	M	200610184	Complete ACL tear	10 mm
N. Vijay	21	M	200610120	Complete ACL tear	11 mm
V. V Raghupathi Rao	32	M	200608522	Complete ACL tear	7 mm
P. Someshwar Rao	48	M	200608646	Complete ACL tear	8 mm
T. Vasu	32	M	200609437	Complete ACL tear	10 mm
Anil Babu	24	M	200607893	Complete ACL tear	7 mm
S. Gangadhar	31	M	-----	Complete ACL tear	9 mm
Rama Krishna Reddy	35	M	-----	Complete ACL tear	7 mm
T. Venkata Ramana	28	M	200608863	Complete ACL tear	11 mm
A. Harsha Vardhan	20	M	200608644	Complete ACL tear	12 mm
Narsimha Chary	32	M	200609209	Complete ACL tear	12 mm
G. John	26	M	200607558	Complete ACL tear	5 mm
V. Srinivas	32	M	200608306	Few Fiber tear of ACL	5 mm
Vamsidhara Reddy	24	M	200607756	Complete ACL tear	1 mm
Sadashiva Rao	35	M	200608037	Complete ACL tear	1 mm
Sovendu Mohanthi	33	M	200609833	ACL tear with Locked Bucket handle MM tear	2 mm



**Laxometry X-Rays : Without weight (Left)  
and With weight (Right) :**



**Fig. 4 :**



**Fig. 5 :**



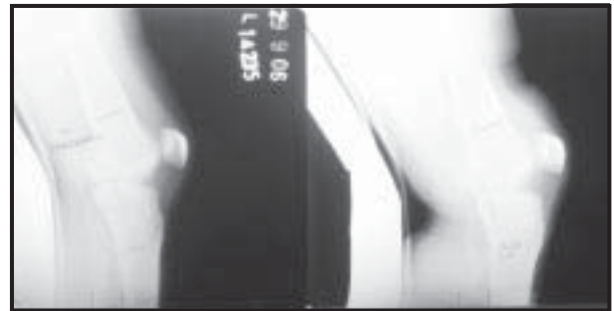
**Fig. 6 :**



**Fig. 7 :**



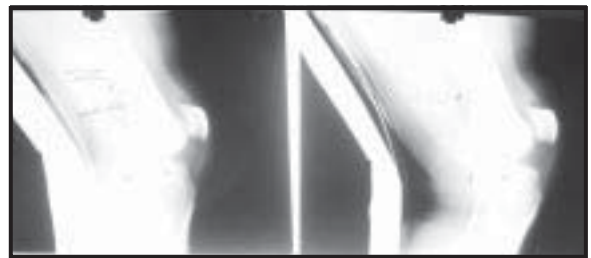
**Fig. 8 :**



**Fig. 9 :**



**Fig. 10 :**



**Fig. 11 :**



**Fig. 12 :**



Fig. 13 :

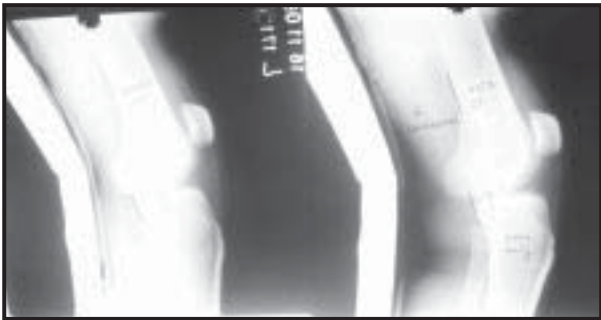


Fig. 14 :



Fig. 15 :

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