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Medial Laxity is Restored Better In MCL Operated Patients than Non-Operated Patients In Single Stage ACL and PCL Reconstruction For Knee Dislocation Type 3 Medial (KD3M) Multi-Ligament Knee Injuries (MLKI)

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Faculty Disclosure Information

- *The authors have no relevant financial or non-financial interests to disclose.*
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AIM

- Aim of this study is to compare
 - clinical & radiological outcomes of
 - MCL **non-operative** vs **operative** management after *single stage ACL and PCL reconstruction*.
- Secondary aim is to determine results of *sub-type of MCL tear*.

Clinical assessment

Follow-up -6 weeks,
-12 weeks,
- 6 months,
-1 year and
- final follow up.

ROM

Valgus stress
@ 0° & 30°

Scar

Drawer test



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Methodology & Selection Criteria

Retrospective cohort, with minimum FU of 2 years,
Study Period: – April 2012 to Sep 2022

Inclusion Criteria

- Age -more than 18 years
- KD3M-type MLKIs

-ACL tear
-PCL tear
-MCL tear

Exclusion Criteria

- Other KD injuries
 - KD2
 - KD3L,
 - KD4,
 - KD5
- Previous knee surgery
- Arthritis
- Open injuries
- No #-Fractures around the knee.

- IRB approval obtained
- Demographic data
 - age,
 - sex
 - Mechanism of injury
 - Time to surgery
 - Graft for both cruciates
 - Associated knee injuries
 - Complications



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Study period – April 2012 to Sep 2022

118 patients with a KD3M injury

- satisfied - *selection criteria*.

100 male and 18 female patients,

Mean age -40.2 years (16 – 72Yrs).

Patients lost to follow
up/
Unwilling to
participate (21)

Patients enrolled (139)

Inclusion &
exclusion criteria

ACL + PCL reconstruction
(118)

Group 1

MCL treated non-
operatively (59)

Group 2

MCL
repair/reconstruction
done (59)

Post op assessment –
Scores &

Stress radiographs – 6m and final followup

Radiological
Assessment:

• Stress radiographs –
“Telos like local made device”

-anterior & posterior translation
-medial opening at 0° & 30° flexion.

• Scores - IKDC score
-Lysholm knee score



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Data – Collected from MRD records

Clinical

- Knee ROM,
- Laxity assessment
- anterior and posterior laxity

Radiological

- Stress x-rays
- Medial laxity at 0° and 30°
- Push & pull views

Scores

- Lysholm Score
- IKDC scores



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Demographic details of the patients, Level of MCL injury and duration

Results

		Group 1 (MCL Conservative)	Group 2 (MCL operative)	P value
Number of Patients (n)		59 (50%)	59 (50%)	
Mean age (years)		40.3 ± 13.1	40.2 ± 13.2	0.958 (ns)
Sex	Male	53 (89.8%)	47 (79.7%)	0.124 (ns)
	Female	5 (10.2%)	12 (20.3%)	
Mechanism of Injury-	RTA [#]	47 (79.7%)	41 (69.5%)	0.351 (ns)
	Sports Injuries	1 (1.7%)	5 (8.5%)	
	Domestic fall	9 (15.3%)	11 (18.6%)	
	Assault	2 (3.4%)	2 (3.4%)	
Side	Right	32 (54.2%)	30 (50.8%)	0.712 (ns)
	Left	27 (45.8%)	29 (49.2%)	
Mean Follow Up (months)		67.69 ± 15.07	66.27 ± 10.87	0.161 (ns)



		Group 1 (MCL Conservative)	Group 2 (MCL operative)	P value
Duration of Symptoms	Acute (<3 weeks)	38 (64.4%)	39 (66.1%)	0.546 (ns)
	Subacute (3-12 weeks)			
	Chronic (>12 weeks)	7 (11.9%)	10 (16.9%)	
Level of MCL injury	Femoral	14 (23.7%)	10 (16.9%)	0.453 (ns)
	Mid-substance	46 (78%)	40 (67.8%)	
	Tibial	5 (8.5%)	8 (13.6%)	
Time to surgery (days)		8 (13.6%)	11 (18.6%)	
		34.68 ± 56.27	36.59 ± 46.37	0.859 (ns)
Associated injuries	Present	23 (39%)	30 (50.8%)	0.195 (ns)
	Absent	36 (61%)	29 (49.2%)	
Complications	Present	3 (5.1%)	5 (8.5%)	0.717 (ns)
	Absent	56 (91.5%)	54 (91.5%)	
Additional Procedures	Done	8 (13.6%)	22 (37.3%)	0.003 (s)
	Not done	51 (86.4%)	37 (62.7%)	

RTA- Road Traffic Accident; ns- not significant; s-significant; Values are presented as mean ± SD or number as % or *number of pati

RESULTS

- Functional scores during - 6 months& final follow up (IKDC, Lysholm- p value 0.05).



Preop scores → Significant improved → Post-operative scores.

		Group 1 KD3M (MCL Conservative)	Group 2 KD3M (MCL operative)	P value
ROM (degrees°)	Pre-operative	95.26 ± 18.21	95.35 ± 18.4	0.632 (ns)
	6 months	110.85 ± 18.13	111.19 ± 19.92	0.923 (ns)
	Final Follow up	116.10 ± 11.89	116.10 ± 11.89	0.286 (ns)
IKDC Score	Pre-operative	27.4 ± 4.8	27.3 ± 4.0	0.933 (ns)
	6 months	70.05 ± 8.46	71.78 ± 5.84	0.200 (ns)
	Final Follow up	81.61 ± 5.27	79.71 ± 5.09	0.049 (s)
Lysholm's Score	Pre-operative	40.8 ± 6.0	45.4 ± 5.4	0.063 (ns)
	6 months	81.76 ± 6.73	83.08 ± 6.13	0.267 (ns)
	Final Follow up	92.19 ± 5.55	91.88 ± 4.97	0.752 (ns)

No significant difference in mean b/t the groups



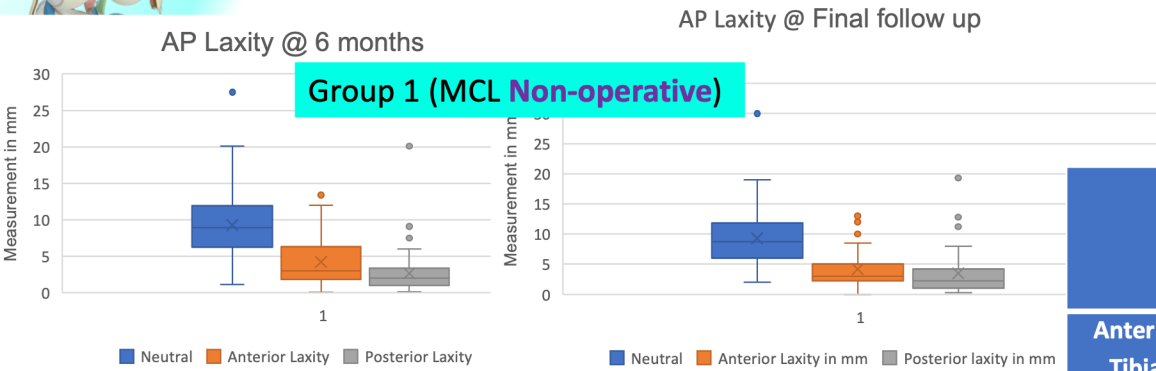
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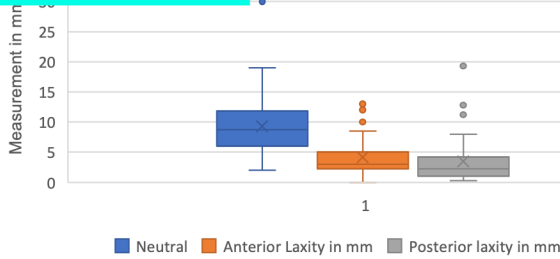


Entire Data- Anterior &posterior -Stress x-ray



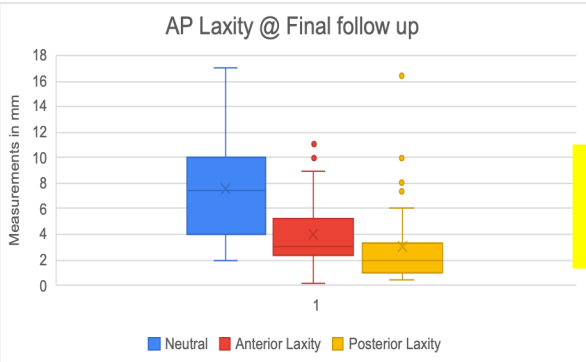
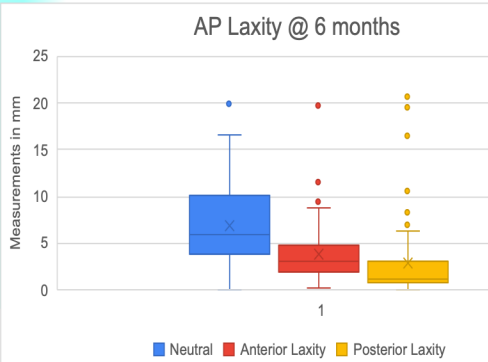
AP Laxity @ Final follow up

In box-whisker plot @ 6m & final follow-up



		Group 1 KD3M (MCL Conservative)	Group 2 KD3M (MCL operative)	P value
Anterior Tibial Translation (mm)	6m follow-up	4.23 ± 3.39	4.09 ± 3.68	0.827 (ns)
	Final Follow up	4.16 ± 3.03	4.07 ± 2.43	0.853 (ns)
Posterior tibial translation (mm)	6m follow-up	2.63 ± 2.92	3.43 ± 5.19	0.307 (ns)
	Final Follow up	3.49 ± 3.48	3.05 ± 2.76	0.439 (ns)

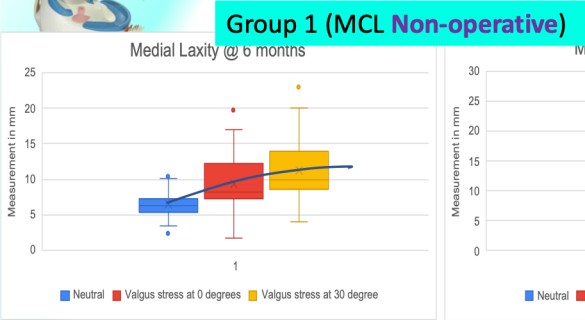
Group 2 (MCL operative)



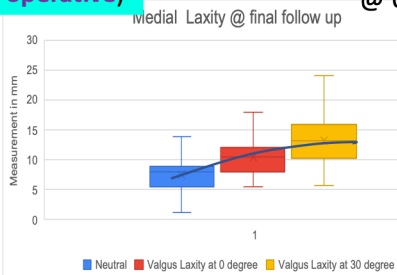
No significant difference in mean value



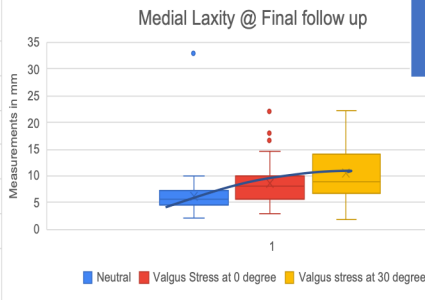
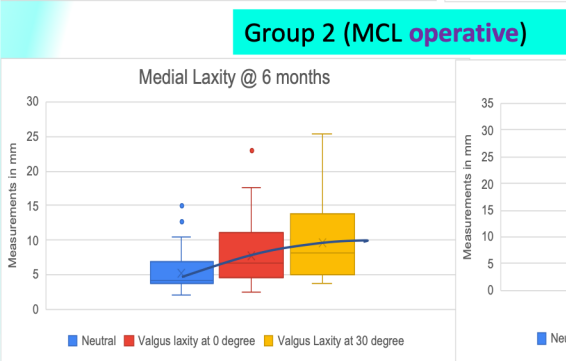
Entire data set- Medial laxity– Stress x-ray



In box-whisker plot @ 6m & final follow-up



		Group 1 KD3M (MCL Conservative)	Group 2 KD3M (MCL operative)	P value
Medial opening at 0° (mm)-	6m followup	9.34 ± 3.29	7.83 ± 4.31	0.034 (s)
	Final Follow up	10.49 ± 2.85	8.36 ± 3.71	0.001 (s)
Medial opening at 30° (mm)	6m followup	11.26 ± 3.95	9.59 ± 5	0.046 (s)
	Final Follow up	13.23 ± 3.92	10.42 ± 4.68	0.001 (s)



Significant difference less Medial-laxity for Group 2 (MCL operative)



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@ final follow-up(Mean±SD)	Group 1	Group 2	P Value
ROM	125.00 ± 9.852	125.33 ± 9.155	0.82(NS)
IKDC Score	74.33 ± 4.201	74.86 ± 4.533	0.86(NS)
Lysholm's score	86.05 ± 4.595	86.06 ± 4.527	0.68(NS)
Posterior laxity	86.11 ± 4.199	86.20 ± 4.523	0.99(NS)
Anterior laxity	2.72 ± 1.918	2.51 ± 1.872	0.59(NS)
Medial opening at 0°	2.87 ± 2.906	2.12 ± 1.213	0.93(NS)
Medial opening at 30°	4.66 ± 2.573	4.39 ± 2.312	0.91(NS)

FEMORAL TEARS

Mean values – Stat.Not significant difference w.r.t scores & Laxity in stress x-rays

Sub group Analysis Group 1 Vs Group 2

TIBIAL TEARS

@ final follow-up(Mean±SD)	Group 1	Group 2	P Value
ROM	125.71 ± 11.339	123.75 ± 7.440	0.64(NS)
IKDC Score	73.57 ± 4.614	76.87 ± 4.051	0.29(NS)
Lysholm's score	85.42 ± 3.259	86.75 ± 5.418	0.52(NS)
Posterior laxity	9.01 ± 2.233	8.37 ± .973	0.34(NS)
Anterior Tibial Translation	2.01 ± 2.233	2.37 ± .973	0.15(NS)
Medial opening at 0°	1.90 ± 1.902	2.83 ± 1.265	0.28(NS)
Medial opening at 30°	4.4160 ± 2.106	4.4925 ±2.28788	0.999(NS)



Sub group Analysis Group 1 Vs Group 2

MIDSUBSTANCE TEARS- results

	Group 1	Group 2	P Value
ROM	122 ± 13.038	120 ± .000	0.641(NS)
IKDC Score	76 ± 4.848	77.83 ± 2.401	0.678(NS)
Lysholm's score	86.6 ± 5.771	87.17 ± 4.708	0.979(NS)
Posterior laxity	8.7 ± 6.000	8.17 ± 4.535	0.686(NS)
Anterior Tibial Translation	3.10 ± .728	3.153 ± 1.501	0.138(NS)
Medial opening at 0°	2.008 ± .994	2.653 ± .824	0.042(Sig)
Medial opening at 30°	3.448 ± 1.753	3.706 ± 1.862	0.043(Sig)

Med opening – more for Conservative





COMPLICATIONS

- **Arthrofibrosis** -4 patients -**stiffness** which was treated with arthroscopic arthrolysis and ROM improved after 3 weeks.
- **Superficial infection**- 5 patients - treated with local debridement and antibiotics.
- **Secondary trauma**,- 2 pts underwent revision reconstruction



DISCUSSION

- The main finding of our study was that there was
 - improved functional outcome and radiologically both groups
 - less laxity in the MCL repair group.
- MCL **femoral side tear** was the most common injury.
- MCL **mid-substance tear** had more medial laxity.

Dedmond et al	surgical versus conservative treatment	statistically significant scores (Lysholm score of 85.2 vs. 66.5) for the surgical group.	No radiological analysis
Levy et al	surgical versus non-surgical management	improved IKDC scores, return to work rates and return to full sport rates in the surgical cohorts	
Peskun et al.¹³	surgical versus non-surgical management	improved Lysholm scores, IKDC scores, and Tegner activity scores.	
Frosch et al	surgical versus non-surgical management	No difference	

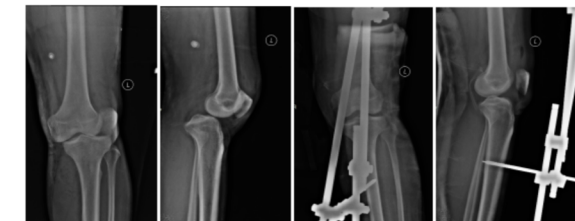
Uniqueness –First Our study
Radiological (stress x-rays)
Introp measurement
and results -level of MCL

CONCLUSION

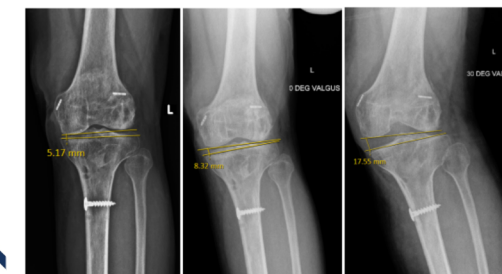
- *No statistical difference in functional difference* in MCL conservative **versus** MCL repair group.
- **MCL Repair** had better radiological medial stability than Non-operative group.
- Cruciate ligament reconstruction, provides around 40-50% medial stability and **introp measurement** can guide MCL management
- Grade 1 or 2 medial laxity(MCL) can be treated non-operative management.

CASE EXAMPLE – ACL-R, PCL-R & MCL non-operative

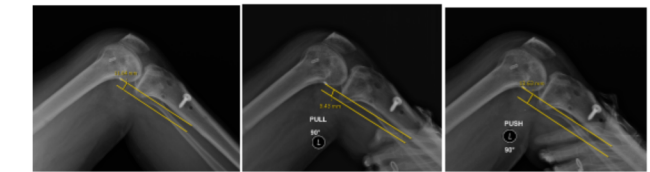
Figure 5 : Case example of 42/M MCL conservatively treated with bicruciate reconstruction



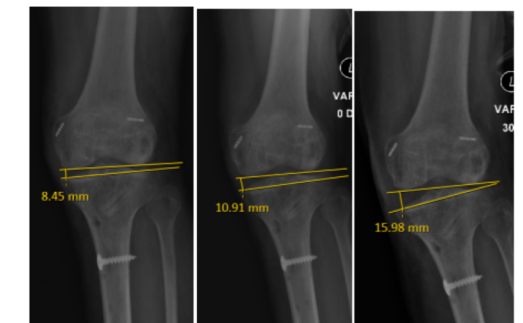
(a), (b), (c), (d) Pre op Radiographs after frank dislocation and external fixator application



(n) Neutral view- 5.17mm (o) 0° valgus stress- 8.32mm (p) 30° valgus stress- 17.55mm



(e) Neutral view - 11.64mm (f) Pull view-9.43mm (g) Push view- 13.63 mm at 6 months
Anterior laxity = 2.21 mm Posterior laxity = 2mm



(h) Neutral view-8.45mm (i) 0° valgus stress- 10.91mm (j) 30° valgus stress- 15.98mm

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