Martin-Luther-Krankenhaus
Ein Unternehmen der Paul Gerhardt Diakonie

Etiology of posterior meniscus root tears: Medial vs. lateral

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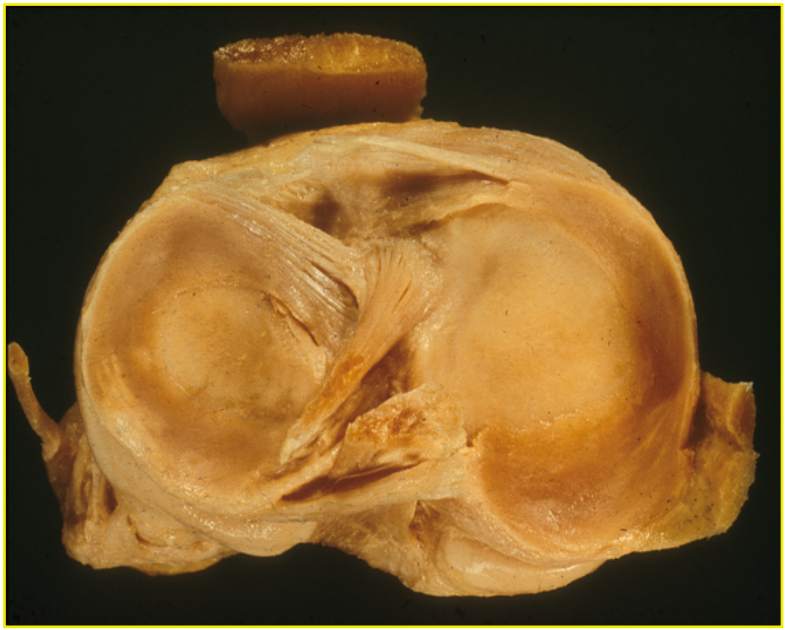
Introduction

Both **menisci** improve the congruity between femur and tibia and **provide uniform distribution of load** across the articular surfaces.

A **root tear** can lead to extrusion of the meniscus and therefore **increase the peak contact pressure** within the joint up to 325%.

Studies have shown that the biomechanical consequences of a medial meniscus root tear (MMRT) are not comparable to lateral meniscus root tear (LMRT) because the **meniscofemoral ligament** transmits circular hoop stress to the femur.

Despite the **biomechanical differences**, treatment recommendations often do not differentiate between medial and lateral root tears, although there are some reports that medial and lateral root injuries also differ in their **etiology**.



Hypothesis

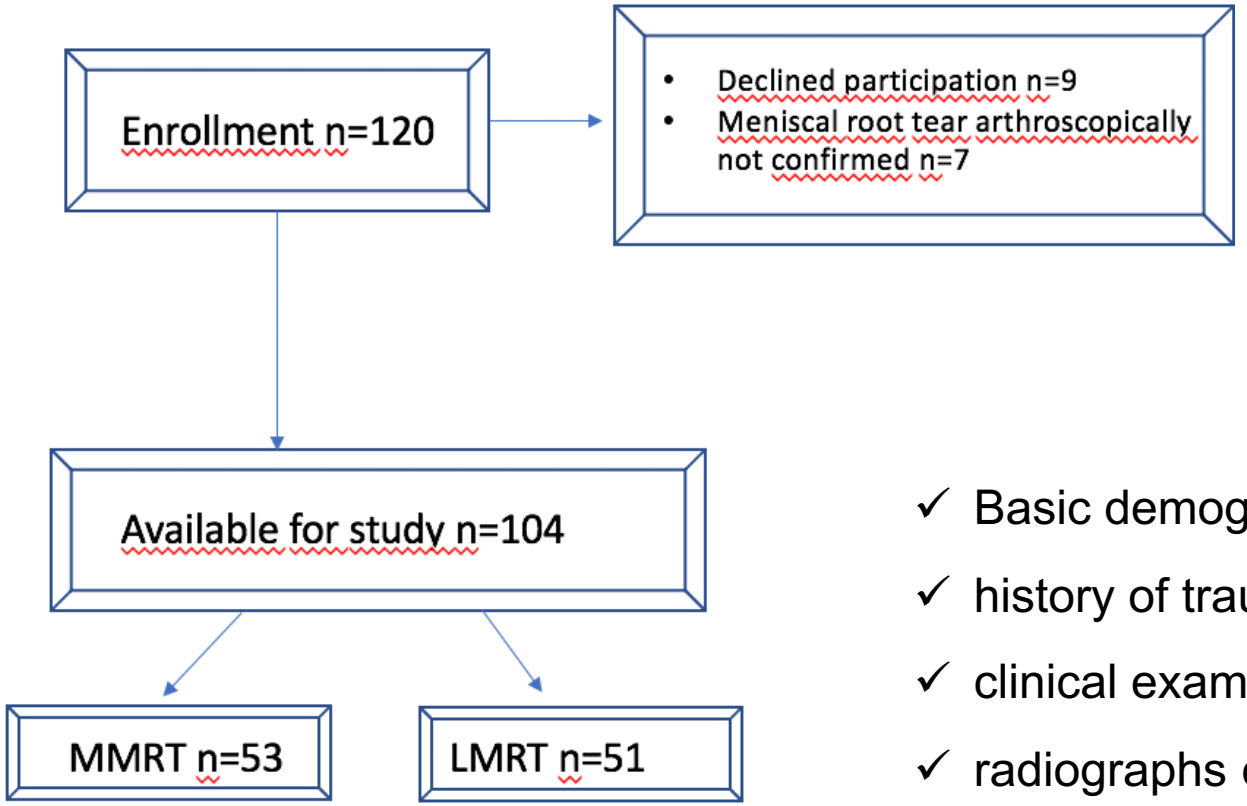
The aim of this study was to collect information on the **etiology and pathogenesis of medial (MM) and lateral meniscus (LM) root tears**.

Our hypothesis was that root tears of the **MM** predominantly result from **degenerative damage**, whereas root injuries of the **LM** are mainly of **traumatic origin**, and will consequently lead to different therapy approaches.

Material & Methods

Inclusion criteria:

- age ≥18 years
- arthroscopically confirmed meniscal root tear lesion



- ✓ Basic demographic data
- ✓ history of trauma
- ✓ clinical examination
- ✓ radiographs of the knee including a.p. long leg axis for limb alignment
- ✓ MRI images

Results - Patient characteristics

	MMRT (N=53)	LMRT (N=51)	P value
Age (years) (±SD)	57.2 (±11.2)	33.9 (±11.4)	0.000
BMI (±SD)	30.5 (±4.9)	25.1 (±2.1)	0.000
Gender female:male	24:29	15:36	0.08
reported trauma	7	45	0.000
ACL injury	3	42	0.000
ICRS cartilage damage	2.7 (±1.1)	1.2 (±1.2)	0.000

There was a **significant difference** in **age and BMI** distribution as well as **reported trauma** between the **medial (MMRT) and lateral (LMRT) meniscus root tear** group.

Results - Radiological assessment

	Medial root tear	Lateral root tear	P value
Mechanical varus (±SD)	5.6° (±2.5°)	2.4° (±2.1°)	0.000
OA (KL) (±SD)	2.1 (±1.2)	0.5 (±0.7)	0.000

In the **MMRT** group, patients presented with significantly **more varus** and a **higher grade of osteoarthritis** (OA) according to Kellgren&Lawrence (KL) compared to the LMRT group.

Results - Subgroup analysis

	MMRT with trauma (N=7)	MMRT without trauma (N=46)	P value	LMRT with trauma (N=45)	LMRT without trauma (N=6)	P value
Age (years)	35.3 (±11.8)	59.3 (± 7.1)	0.000	31.9 (±10.8)	47.6 (±3.2)	0.006
BMI	28.7 (±4.9)	30.9 (±4.9)	0.136	25.2 (±2.1)	24.5 (±2.1)	0.535
Mechanical varus	4.8° (±2.3°)	5.7° (±2.6°)	0.315	2.9° (±1.7°)	-1.3° (±1.1°)	0.022
OA (KL)	0.5 (± 0.8)	2.3 (±1.1)	0.000	0.4 (±0.7)	1.0 (±0.7)	0.054

In both groups **MMRT and LMRT**, subgroups of patients with **traumatic and non-traumatic etiology** could be identified.

In both groups MMRT and LMRT patients with a **trauma** in history were significantly **younger** than the non-trauma patients and presented with **less OA**.

There was **no significant difference** in **BMI** nor **mechanical axis** between traumatic and non-traumatic MMRT and LMRT.

Patients with a **non-traumatic LMRT** had **more valgus** compared to patients with a LMRT and a history of trauma.

Results – MRI findings

	MMRT (N=53)	LMRT (N=51)	P value
Extrusion > 3mm	N=46	N=8	0.000
Mean extrusion (mm)	3.1 (±0.9)	1.4 (±1.0)	0.000
Ghost sign	N=44	N=12	0.000
Osteonecrosis	N=8	N=0	0.000

There was a **significant difference** in the mean **meniscal extrusion** between MMRT and LMRT.

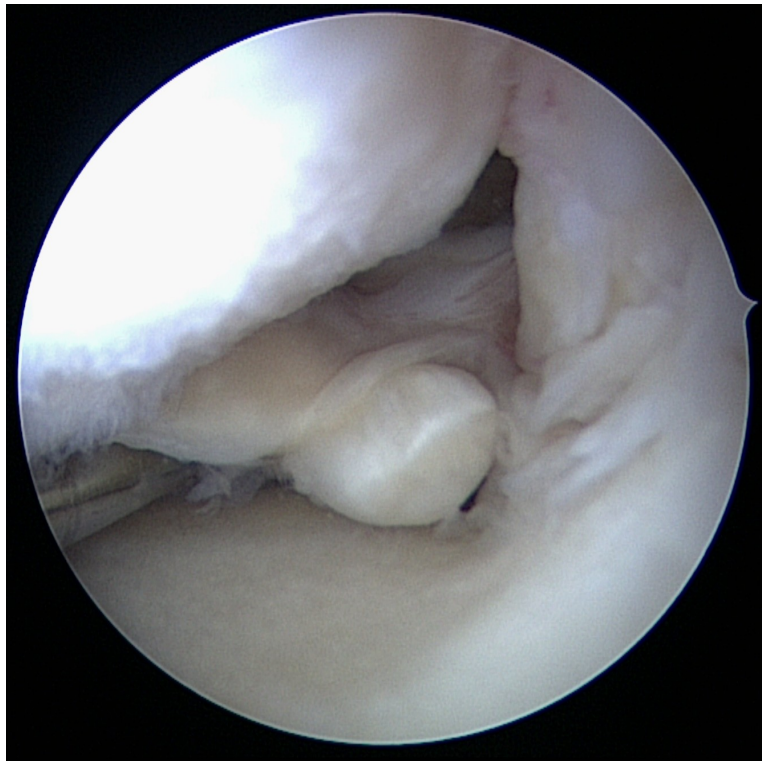
In the **MMRT** group **bone marrow edema** in the medial compartment was present in **37 patients**. In **8 patients** of the MMRT group signs for an **osteonecrosis** of the femoral condyle could be detected.

In the **LMRT** group **34 patients** had **bone marrow edema**. In **none** of the patients of the LMRT group an **osteonecrosis** of the femoral condyle was visible.

Conclusion

The **root injuries** of the **medial and lateral meniscus** show **significant differences** in terms of **patient population**, **etiology** and **accompanying injuries**.

Root injuries of the **medial meniscus** are mostly of **degenerative origin** and more likely to occur in the context of **medial osteoarthritis** of the knee or accompanied by **bone marrow edema** of the medial compartment due to increase in pressure.



Lateral root tears tend to be **traumatic** and are associated with **ruptures of the anterior cruciate ligament** (ACL).

! However, the detection subgroups of traumatic MMRT and non-traumatic LMRT needs further attention. !

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