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Prognostic Indicators of Graft Rupture After Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-Analysis

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Faculty Disclosure Information

- Nothing to disclosure



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Introduction

- Approximately **10%** of the individuals aged < 25 years who returned to their pre-injury activity level after primary ACLR suffered a secondary ACL injury to their ipsilateral knee¹

Objective: Identify and quantify the risk factors associated with graft rupture following tibial-tunnel arthroscopic ACLR



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Methodology

Databases:

- Central
- Web of Science
- SCOPUS
- SportDiscus
- PubMed

Randomised Controlled Trials

focused on **ACL
graft rupture**
following
*conventional tibial-
tunnelled ACLR*

Records identified

n=1719

Articles remaining

n=1196

Full texts assessed for eligibility

n=108

Articles included in review

n=18

Duplicates excluded

n=523

Excluded

n=1088

Excluded

n=90



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Results

	Meta Analysis (5 factors)	Isolated Reporting (6 factors)
Statistically Significant	1. ACLR augmentation with LET vs ACLR alone 2. ACLR augmentation with anterolateral stabilisation techniques vs ACLR alone 3. Posterior tibial slope angle	1. ACLR alone vs ACLR + MITBT 2. ACLR + LET vs ACLR + MITBT
Not Statistically Significant	1. BPTB vs hamstring graft 2. Ipsilateral vs contralateral graft	1. Quadrupled hamstring tendon vs doubled tibialis anterior 2. Double vs single hamstring tendon 3. Acute vs delayed ACLR 4. Bioabsorbable screw vs metal screw fixation after ACL reconstruction



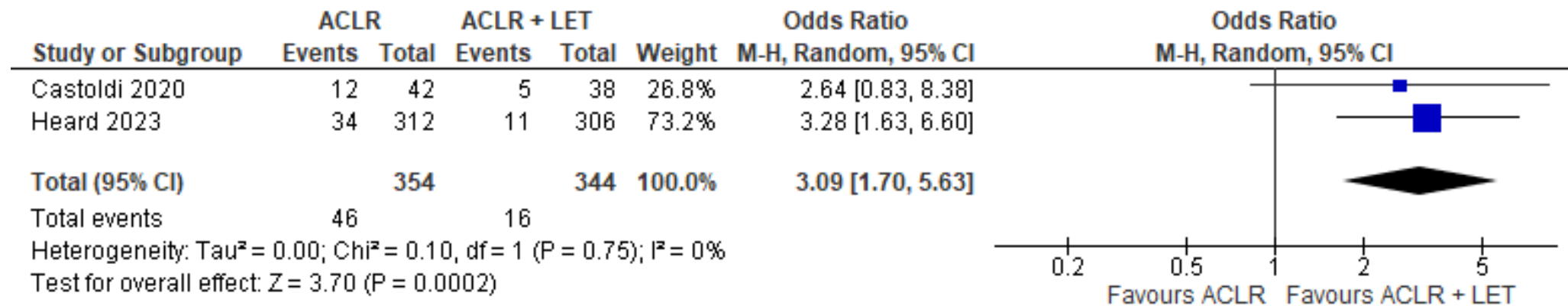
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Presence of LET

Additional Augmentation



- Patients who received an **ACLR alone** were at a **greater risk of suffering from graft failure** compared to those who underwent an ACLR and a concurrent lateral extra articular tenodesis^{2,3}
- OR 3.09; 95% CI 1.70-5.63, **p < 0.001**



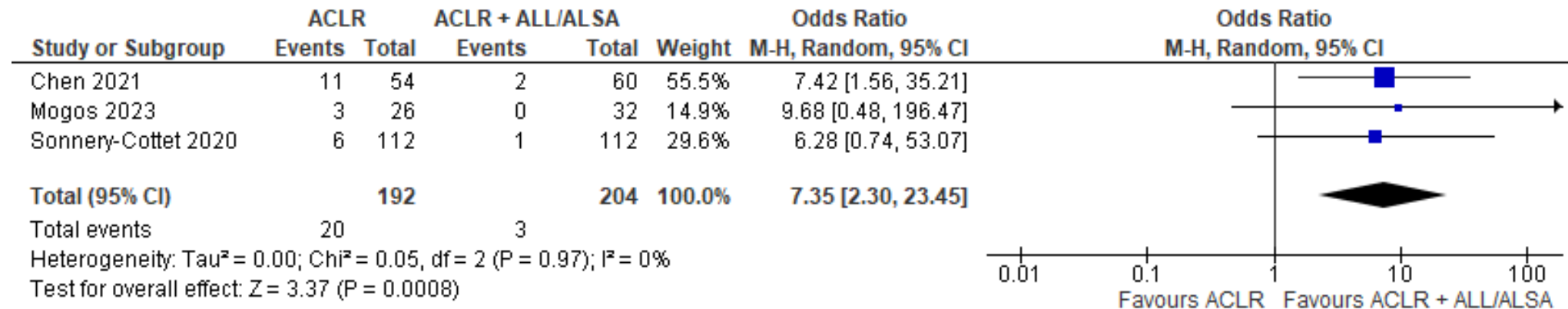
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Presence of Anterolateral Stabilisation Techniques

Additional Augmentation



- 2 primary techniques – anterolateral ligament augmentation & anterolateral structural augmentation
- Patients who underwent an **ACLR alone** were at a **greater risk of suffering from a graft failure** compared to those who underwent an ACLR and concurrent ALL or ALSA⁴⁻⁶
- OR 7.35; 95% CI 2.30-23.45, **p < 0.001**

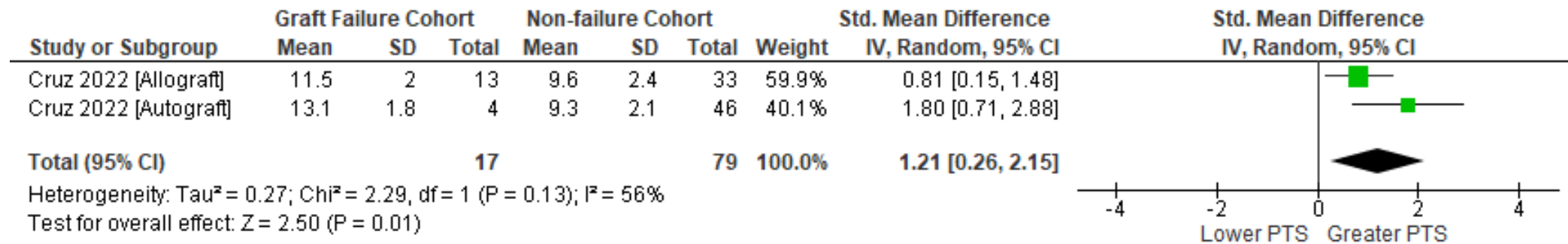


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Posterior Tibial Slope Pre-operative



- Data from single study⁷
- A **greater postoperative posterior tibial slope**, of 11.9 ± 2.0 degrees compared to 9.4 ± 2.2 degrees, was **positively correlated with an increased risk of re-rupture**
- SMD 1.21; 95% CI 0.26-2.15, $p < 0.00001$

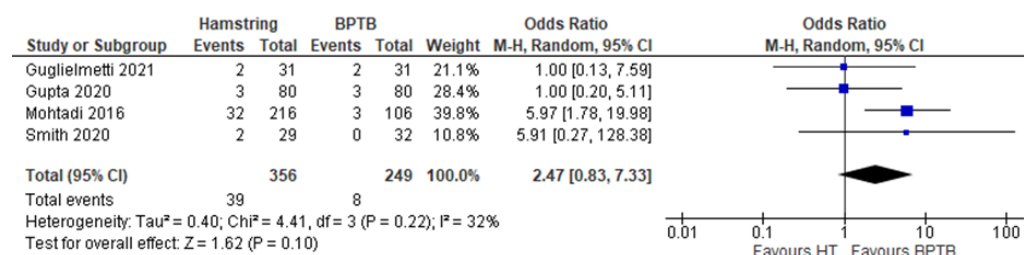


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Hamstring vs BPTB



- There is **no significant difference** in rates of rupture between patients with a **hamstring graft** and those with a **bone-patella tendon-bone graft**⁸⁻¹¹
- OR 1.30; 95% CI 0.40-4.19, **p = 0.67**



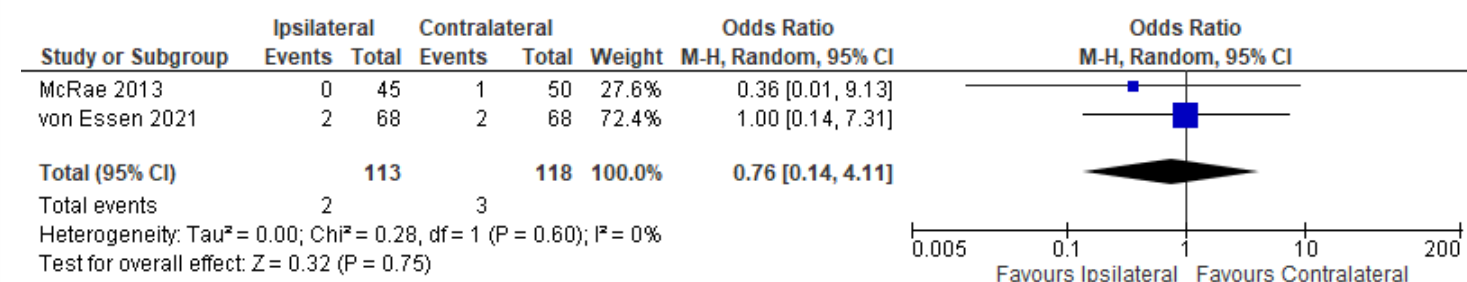
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Donor Site

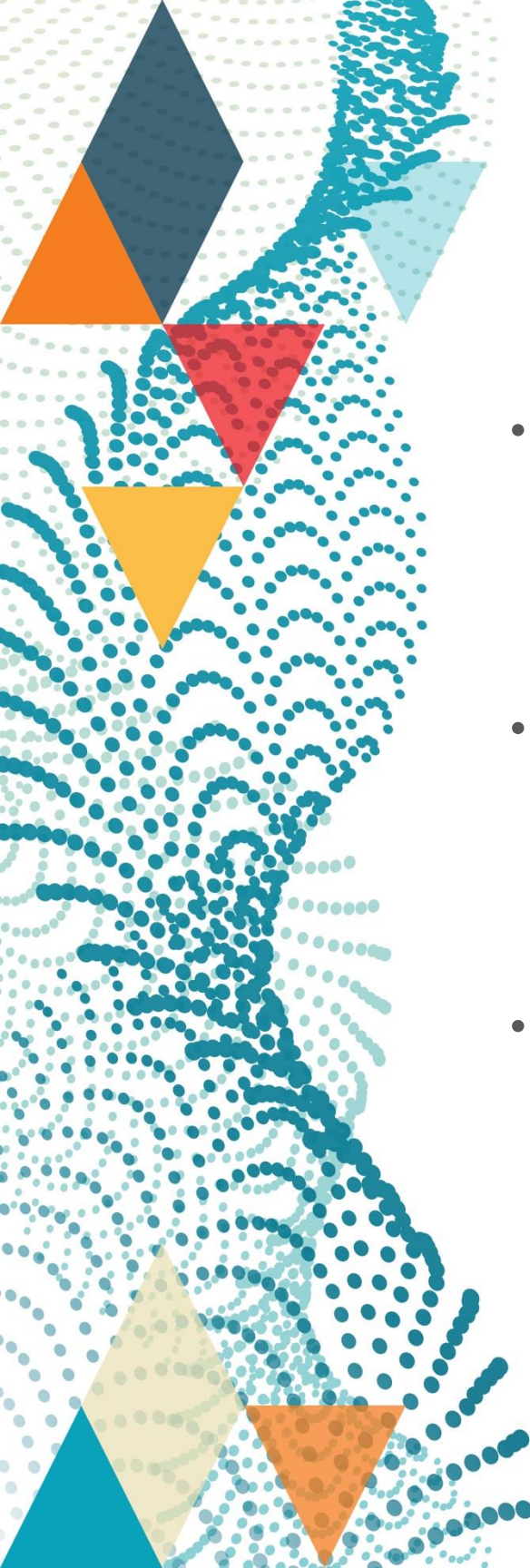
Surgical Factors



- There is **no significant difference** in rates of rupture between patients with an **ipsilateral** and a **contralateral** graft^{12,13}
- OR 0.76; 95% CI 0.14-4.11, **p=0.75**

Discussion – Comparison to other SRMAs

Study	Study Population	Smaller PTS	ACLR + LET	ACLR + ALSA	HT vs BPTB	Ipsilateral vs Contralateral graft
Crönstrom 2023 ²⁰	133,000	✓	NR	NR	NR	NR
Zhao 2023 ²¹	629,120	✓	NR	NR	✓	NR
Shen 2021 ²²	NR	✓	NR	NR	NR	NR
Liechti 2016 ²³	214	✓	NR	NR	NR	NR
Onggo 2021 ²⁴	1106	NR	✓	NR	NR	NR
Na 2021 ²⁵	2376	NR	✓	✓	NR	NR
Schuette 2017 ²⁶	1396	NR	NR	NR	✗	NR
Fan 2023 ²⁷	1762	NR	NR	NR	NR	✗
Current Study	2450	✓	✓	✓	✗	✗



Limitations

- Lack of unification of ACL graft rupture definition
- Sub-group analysis limited due to insufficient data
- Limited validity of Egger's test to assess for publication bias²⁸



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Conclusion – Factors that reduce the risk of graft failure

1. Smaller posterior tibial slope of 9.4 ± 2.2 degrees compared to 11.9 ± 2.0 degrees
2. ACLR augmentation with lateral extra articular tenodesis
3. ACLR augmentation with anterolateral stabilisation techniques
4. ACLR augmentation with modified iliotibial band tenodesis
5. ACLR augmentation with modified iliotibial band tenodesis as compared to a lateral extra articular tenodesis



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