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All-autograft algorithm can effectively address multiligament knee injuries:

rationale and outcomes at medium-term follow-up

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Faculty Disclosure Information

- Nothing to disclosure

Introduction

- The multiligament injured knee represents a challenging and controversial topic in knee trauma
- Injury mechanism usually involves high energy trauma
- In the acute setting it can involve vascular compromise, while instability and arthritis are long-term risks
- Due to paucity of high-level EBM studies and diversity of injury complexities, there is uncertainty regarding optimal management strategies (Makaram NS, et al. *Br J Sports Med* 2023)

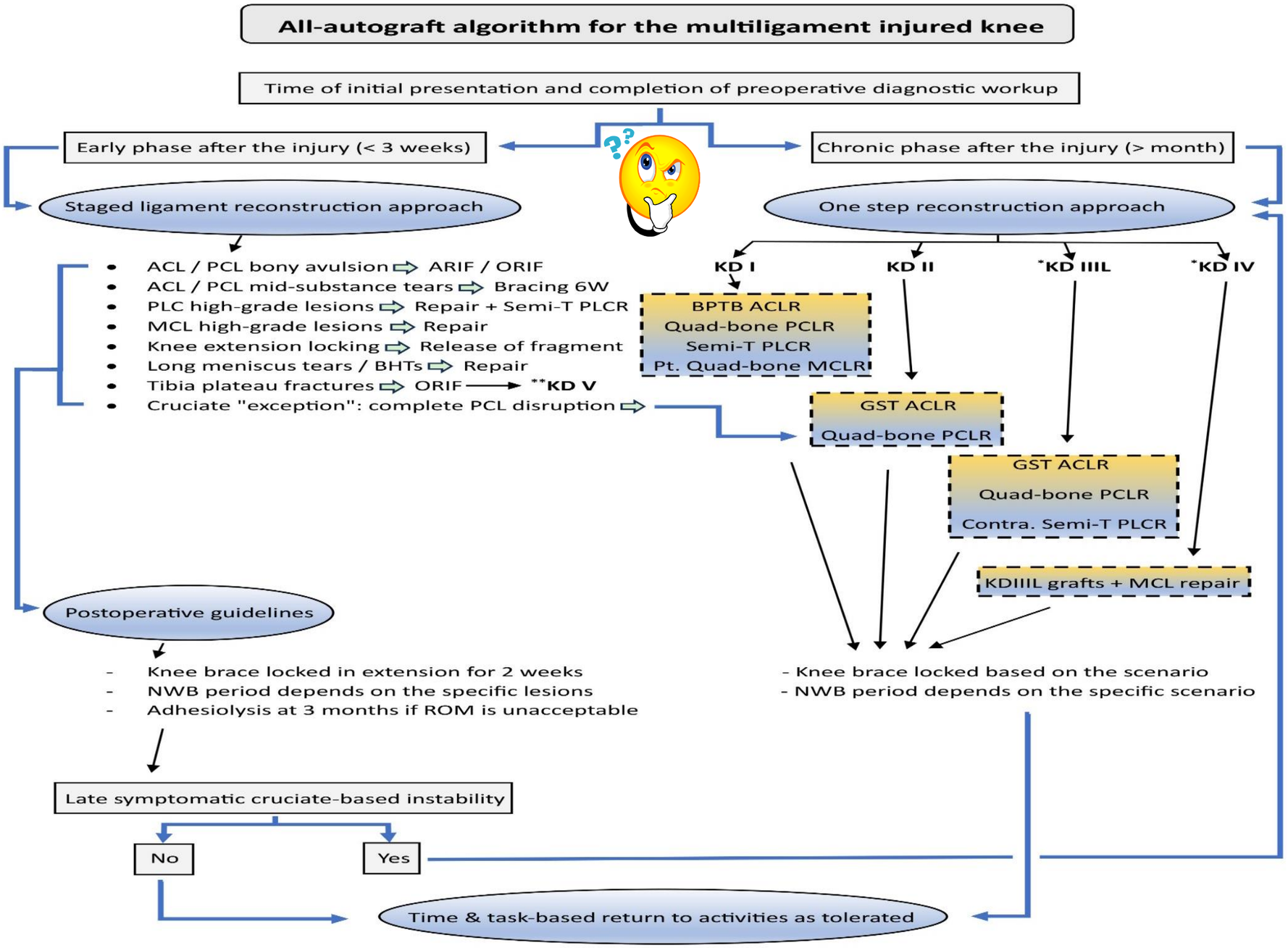
Background and driving force for this study

Due to inaccessibility to non-irradiated allografts in our health care system until 2020, we have elaborated in 2012 rationale-based all-autograft algorithm for managing multiligament knee-injuries, considering the EBM literature available

Purpose of this study

To present all-autograft algorithm designed to address multiligament knee injuries, and to report mid-term outcomes

All-autograft algorithm for the multiligament injured knee



*In this series, high-grade MCL lesions in KD IIIM, KD IV and KD V scenarios were repaired and "anchor-braced".

**Graft used depends on the specific lesioned ligaments as indicated in KD I - IV

The algorithm

Study population

- ✓ Multiligament knee injury
- ✓ Diagnosed and treated between 2013-2020
- ✓ Autograft-only management
- ✓ > 2 years follow-up

***n* = 25**

- ✓ One KD-I case: Not treated according to the MLKI autograft algorithm (PCL soft tissue repair instead of PCL reconstruction).
- ✓ One KD-IIIM case: Not treated according to the MLKI autograft algorithm (ACL soft tissue repair instead of ACL reconstruction).

***n* = 2**

✓ Remaining cohort

***n* = 23**

- ✓ One KD-I case: Excluded due to other medical illnesses (alcohol addiction, delirium tremens episodes, and additional motorcycle accident with open fractures of the lower limbs).
- ✓ One KD-IIIM case: Excluded due to other medical illness (lung cancer requiring lobectomy, chemotherapy and radiotherapy).

***n* = 2**

✓ Remaining cohort

***n* = 21**

- ✓ One KD-IIIM case: Lost to follow-up (medical chart follow-up data available only at a few months after surgery. This patient then appeared at 2 years after the MLKI surgery in the ER due to another motorcycle accident and was operated due to ipsilateral open tibia fracture. The fracture healed but the patient was lost to follow-up).

***n* = 1**

✓ **Final cohort**

***n* = 20**

[KD-I (*n*=8); KD-II (*n*=2); KD-III (*n*=2); KD-IV (*n*=2); KD-V (*n*=6)]

Measure	Value
IKDC-subjective	79 ± 15
KOOS-Symptoms	81 ± 17
KOOS-Pain	84 ± 18
KOOS-ADL	88 ± 15
KOOS-Sports	66 ± 27
KOOS-QOL	57 ± 23
MLQOL-Physical Impairments	25 ± 20
MLQOL-Emotional Impairments	29 ± 22
MLQOL-Activity Limitations	29 ± 22
MLQOL-Societal Involvement	30 ± 25
Quadriceps peak torque symmetry index ≤ 10%	65% of patients
Jump-Squat symmetry index ≤ 10%	50% of patients

Independent variables Functional outcomes	Schenck KD grade	Tegner level at pre-injury	Marx score at pre-injury
Tegner level at follow-up	***r*= -0.6; *p*<0.01**	***r*= 0.6; *p*=0.01**	***r*= 0.4; *p*=0.05**
Marx score at follow-up	***r*= -0.5; *p*=0.05**	***r*= 0.5; *p*=0.05**	*r*= 0.4; *p*=0.1
IKDC-Subjective	***r*= -0.6; *p*<0.01**	*r*= 0.3; *p*=0.2	*r*= 0.2; *p*=0.3
KOOS-Symptoms	***r*= -0.6; *p*<0.01**	*r*= 0.3; *p*=0.2	*r*= 0.2; *p*=0.4
KOOS-Pain	***r*= -0.5; *p*=0.04**	*r*= 0.3; *p*=0.2	*r*= 0.4; *p*=0.1
KOOS-ADL	***r*= -0.5; *p*=0.03**	*r*= 0.3; *p*=0.3	*r*= 0.3; *p*=0.3
KOOS-Sports	***r*= -0.5; *p*=0.04**	*r*= 0.1; *p*=0.6	*r*= 0.2; *p*=0.5
KOOS-QOL	*r*= -0.2; *p*=0.5	*r*= 0.1; *p=1*.0	*r*= 0.1; *p*=0.9
MLQOL-PI	***r*= 0.7; *p*<0.01**	*r*= -0.3; *p*=0.2	*r*= -0.2; *p*=0.4
MLQO-EI	***r*= 0.5; *p*=0.04**	*r*= -0.1; *p*=0.6	*r*= -0.1; *p*=0.6
MLQOL-AL	***r*= 0.5; *p*=0.04**	*r*= -0.1; *p*=0.6	*r*= -0.2; *p*=0.5
MLQOL-SI	*r*= 0.4; *p*=0.08	*r*= 0.1; *p*=0.7	*r*= 0.1; *p*=0.9

Correlation coefficients

Conclusions

The suggested all-autograft algorithm can effectively address multiligament knee injuries based on a preliminary-sized cohort, showing favorable functional outcomes at 4 to 10-year follow-up. The outcome strongly correlates with the KD injury grade.

This is valuable for medical facilities where high-quality allografts are not available and also holds the potential for optimizing cost-effective management of medical resources, though larger series are desired to validate the findings.

- Hetsroni I, et al. Combined reconstruction of the MCL and ACL using ipsilateral Quad tendon-bone… *Arth. Tech*. 2016
- Hetsroni I, et al. All-autograft multiligament knee reconstruction of the PCL, ACL and PLC (KD-IIIL). *Arth. Tech*. 2021