The Impact of Time to Anterior Cruciate Ligament Reconstruction on Return to Duty among Active-Duty Military Personnel

CPT Brandon Burt, MPAS, APA-C, CSCS
CPT JT Evans, DSc, APA-C
MAJ Preston Lopez, DSc, PA-C
Mr. Joshua Sakai, MS

Madigan Army Medical Center (MAMC)
Joint Base Lewis-McChord, WA

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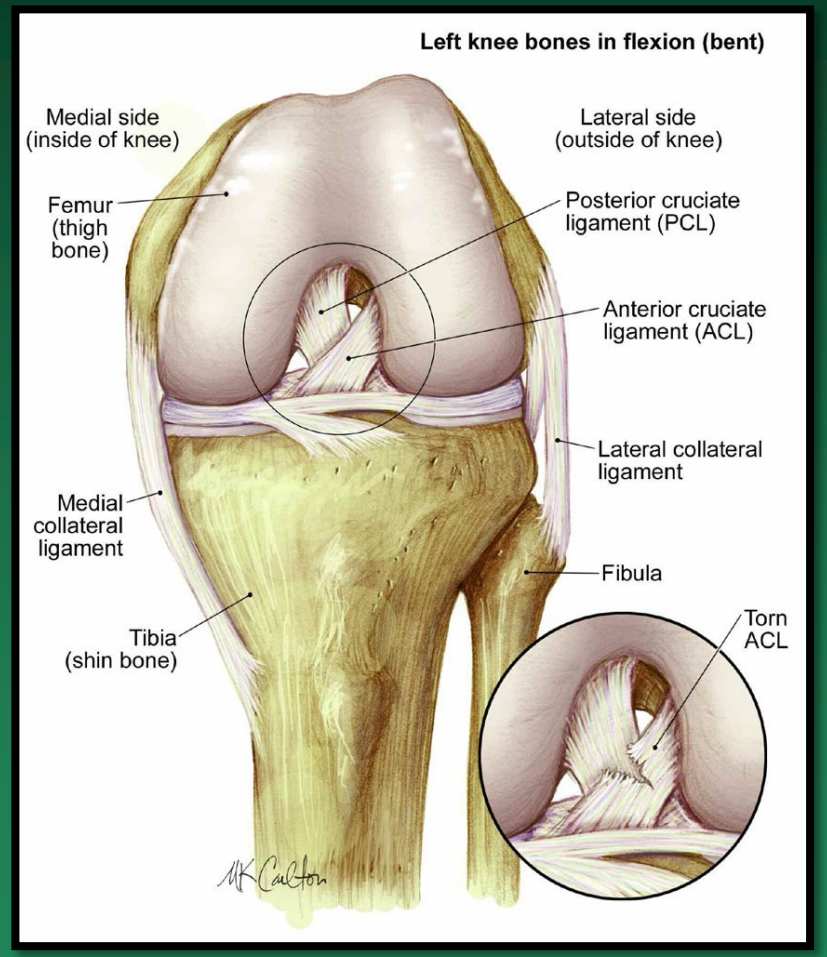
Key Terms

- Anterior Cruciate Ligament Reconstruction (ACLR)
- Return to Duty (RTD)
- Permanent Profile (PP)
- Medical Evaluation Board (MEB)



Introduction

- Due to the high physical demands, many service member will opt for ACLR.
- ACLR is one of the most performed orthopedic surgeries in the military, with approximately 2,500 – 3,000 performed annually (Bottoni et al., 2008).
- Over 50% of service members who undergo ACLR receive a PP or MEB (Antosh et al., 2018).
- Time to ACLR may be a modifiable factor to optimize patient outcomes and mitigate medical separation.

Purpose

To assess the impact of time to ACLR on RTD in an active-duty military population.

But why ACLR?

Early ACLR

- Historically, early ACLR (< 3 weeks from injury) was associated with increased development of arthrofibrosis (Shelbourne et al., 1991).
- Bottoni et al. (2008) found no differences in postoperative ROM between ACLR performed < 3 weeks and > 6 weeks.
- Herbst et al. (2017) found no difference in patient outcomes with ACLR performed <48hrs to those performed outside the initial inflammatory state (mean = 53.9 days).

Delayed ACLR

- Everhart et al. (2019) observed that ACLR performed > 8 wks were associated with increase in partial medial meniscectomies and ACLR >5 months had increased likelihood of grade 3 or 4 chondral defect.

- Keyhani et al. (2020) observed a higher incidence of lateral meniscus tears with acute ACLR, and delays > 3 months associated with higher incidence of medial meniscus tears.

- Hagmeijer et al. (2019) observed higher rates of secondary medial meniscus tears in ACLR > 6 months that were often complex and required meniscectomy.

Early versus Delayed ACLR

- Few studies observed the impact of return to work or return to sport.
- Von Essen et al. (2020) found fewer sick-leave days for ACLR performed < 8 days to those performed 6 – 10 weeks.
- Muller et al. (2022) observed increased likelihood of return to sport in patients who underwent ACLR < 3 months.

No military studies exist specifically evaluating the relationship between time to ACLR and return to duty.

Hypothesis

Hypothesis:

- Patients who undergo ACLR further from their initial injury will have a lower rate of RTD compared to those who undergo ACLR sooner.

Research Question

Primary question:

- Does time to ACLR impact RTD outcomes among active-duty military personnel?

Secondary question:

- Does time to ACLR affect the incidence and type of meniscal procedure performed in conjunction with ACLR?

Outcomes

Primary Outcome:

- The number of patients who were RTD, received a PP or underwent a MEB.

Secondary Outcome:

- The number and type of meniscal procedures performed in conjunction with ACLR.

Methods

- Retrospective observational study
- Active-duty military personnel who underwent primary ACLR
- Madigan Army Medical Center, JBLM, WA
- October 2016 – December 2022

Participant Selection

Inclusion criteria

- Active-duty military
- Underwent primary ACLR at MAMC
- October 2016 – December 2022
- Minimum one year follow up

Exclusion criteria

- Multiligamentous knee injury
- Concomitant procedure other than meniscal repair or debridement
- Subsequent procedure
- Postoperative complication
- Underwent MEB for other condition
- Preexisting lower extremity PP

Methods

Independent variable

- Time to ACLR separated into four 4 subgroups
  - 0 – 3 months, 3 – 6 months, 6 – 12 months, > 12 months

Dependent variables

- Number of RTD, PP or MEB outcomes
- Number and type of meniscal procedures

CPT Code 29888
Identified 420 participants that underwent ACLR at MAMC between OCT 2016 – DEC 2022

Individually screened EMR

165 participants met criteria

Final data collected via EMR and MEDPROS review

Exclusion Criteria

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Excluded 255 participants

Statistical analyses conducted on disposition, time interval, and meniscal procedure groups

Statistical Analysis

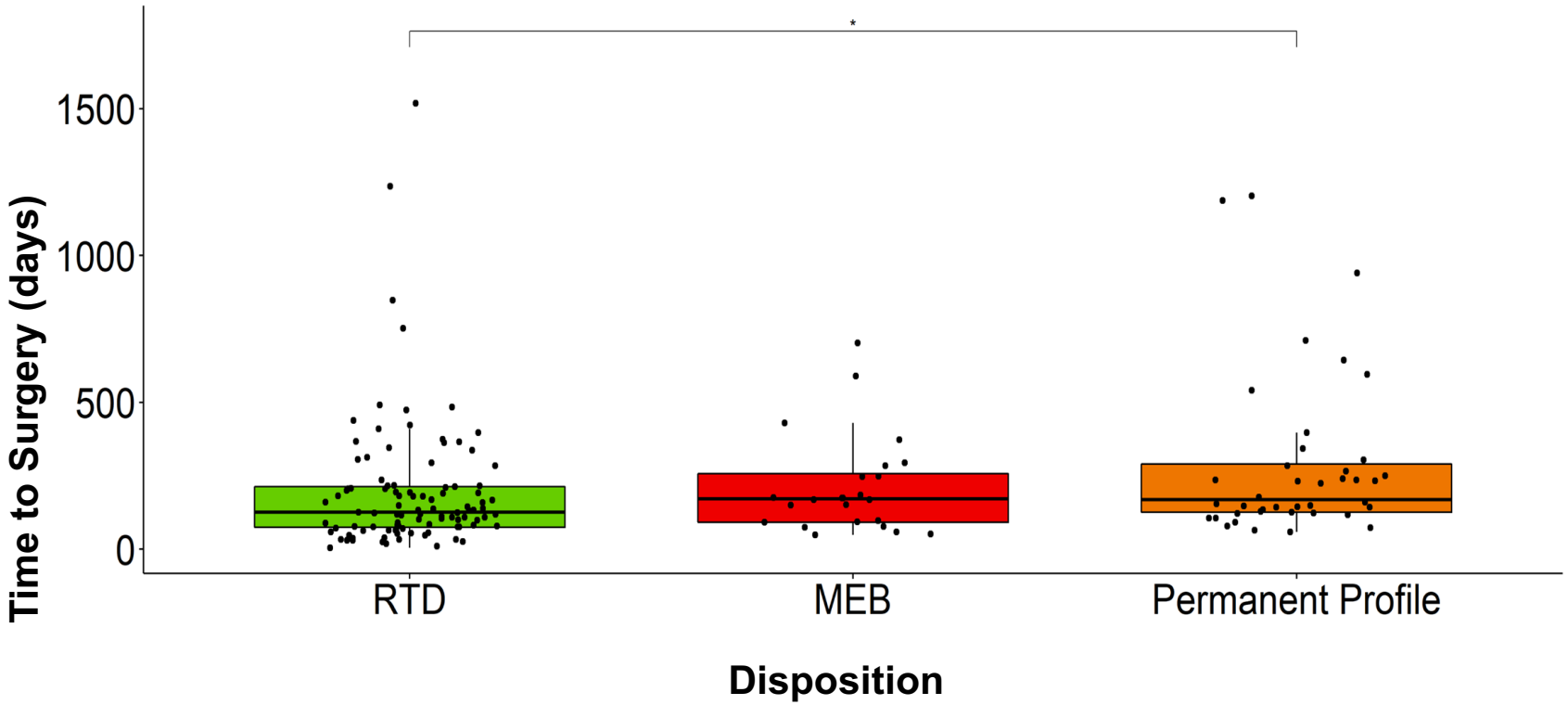
- Kruskal-Wallis and Dunn's test initially used to determine if significance existed among the different disposition groups (RTD, PP, MEB).
- 2x2 Fisher's exact tests conducted between consecutive date range groups.
  - MEB and PP outcomes were grouped together as 'negative' outcomes post-surgery.
- Kruskal-Wallis and Dunn's test to determine significance of meniscal procedures performed (none, debridement, repair).

Results

- Time to ACLR significantly impacted RTD (p=0.019; Figure 1).
- Higher incidence of RTD in the 0–3-month group with a stabilization in outcomes distribution after 3 months (p=0.006, Figure 2).
- Time to ACLR significantly impacted the incidence and type of meniscal procedure (p = 0.0025; Figure 3).
- 61.2% of patients who underwent ACLR returned to duty without limitations, while 24.2% received a PP restriction and 14.5% underwent a MEB.

Impact of time to ACLR on Disposition

Kruskal-Wallis, $\chi^2(2) = 7.87$, $p = 0.019$, $n = 165$



Disposition	n	min	max	median	iqr	mean	sd	se	ci
RTD	101	5	1518	126.0	138.00	195.050	225.472	22.435	44.511
MEB	24	49	702	171.5	165.00	212.708	166.926	34.074	70.486
Permanent Profile	40	59	1203	168.5	163.75	290.175	285.300	45.110	91.243

Figure 1.

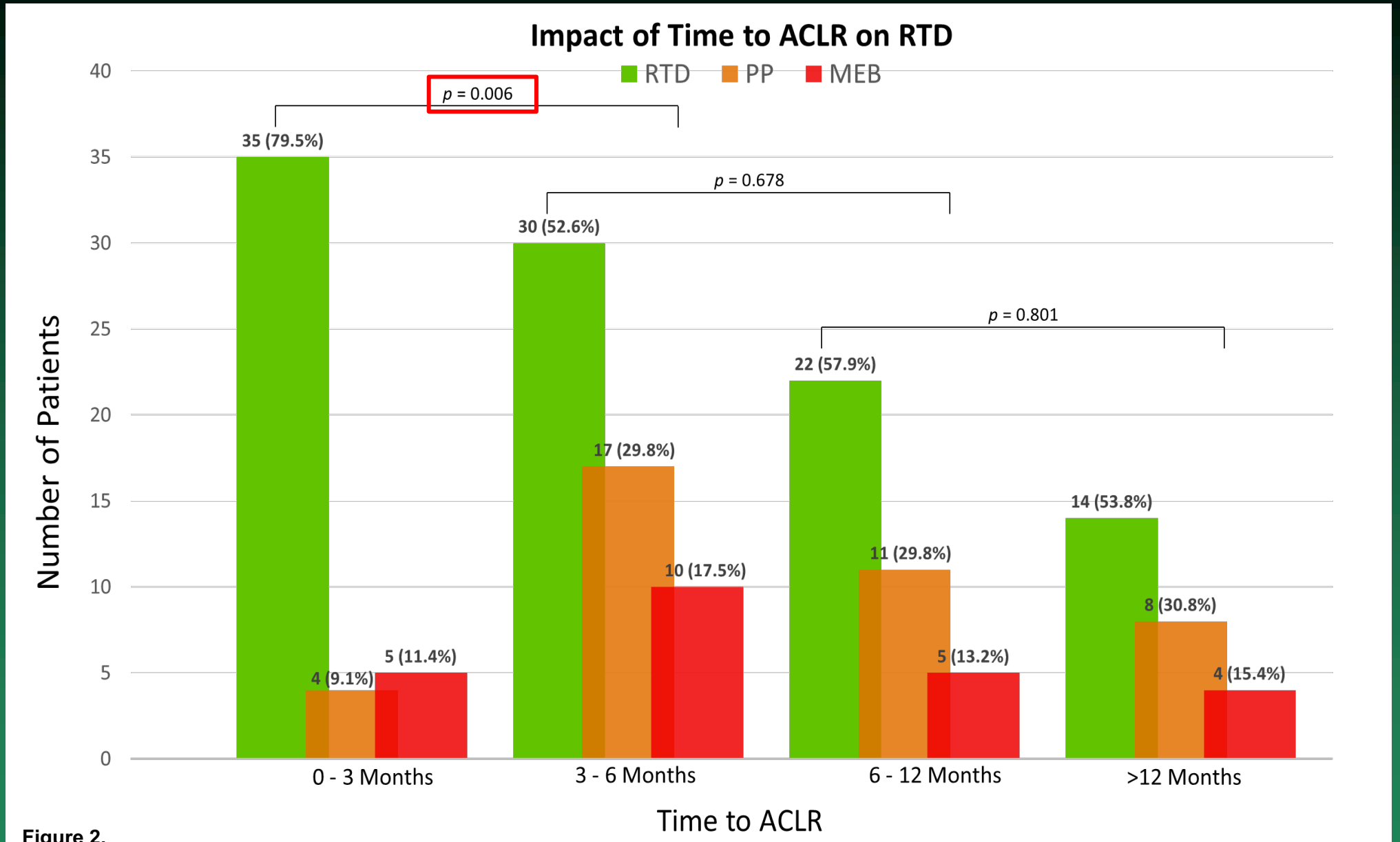
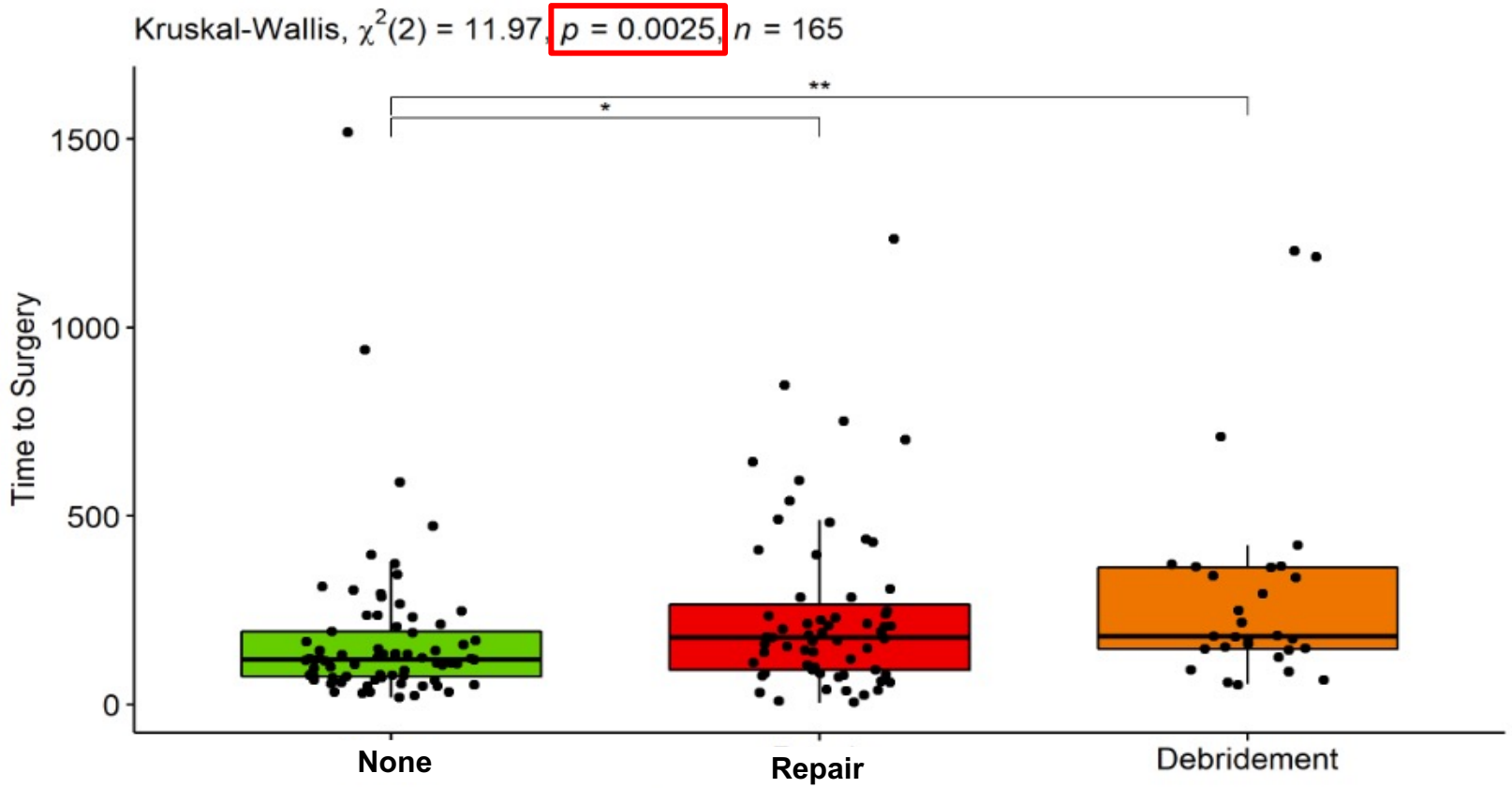

Impact of Time to ACLR on RTD
RTD
PP
MEB
Number of Patients
Time to ACLR
0 - 3 Months
3 - 6 Months
6 - 12 Months
>12 Months
p = 0.006
p = 0.678
p = 0.801
35 (79.5%)
4 (9.1%)
5 (11.4%)
30 (52.6%)
17 (29.8%)
10 (17.5%)
22 (57.9%)
11 (29.8%)
5 (13.2%)
14 (53.8%)
8 (30.8%)
4 (15.4%)
0
5
10
15
20
25
30
35
40

Figure 2.

Impact of time to ACLR on Meniscal Procedure



Meniscal Procedure	n	min	max	median	iqr	mean	sd	se	ci
None	73	18	1518	119	120.0	174.959	213.961	25.042	49.921
Repair	63	5	1235	177	173.5	239.444	228.377	28.773	57.516
Debridement	29	53	1203	181	216.0	295.000	286.319	53.168	108.910

Figure 3.

Discussion

- Increased RTD rate was observed in ACLR performed < 3 months post-injury.
  - Similar finding to Muller et al. (2022).
- No significant difference in time to ACLR between RTD and MEB group.
  - Lower overall incidence of MEB compared to Antosh et al. (2018).
  - Possibly due to exclusion of complications & subsequent procedures.
- Patients who underwent ACLR < 6 months post-injury had a lower incidence of concomitant meniscal procedure.
  - Similar finding to Hagmeijer et al. (2019).

Limitations

- Determinations on RTD for veterans and personnel in other military branches were assumed based on recent EMR data.
- Factors such as surgical technique and physical therapy adherence were not accounted for.
- RTD status is nuanced and may not accurately capture an individual's true physical capabilities after ACLR.

Future Directions

- Future research should examine the impact of time to ACLR on:
  - Intra-articular injuries observed at time of ACLR
  - Concomitant procedures performed
    - LM, MM repair and/or debridement, chondroplasty, etc.
  - Incidence of graft failure and revision
  - Rate of subsequent surgeries
  - Army Combat Fitness Test (ACFT) Scores

Conclusion

- Performing ACLR within 3 months from initial injury can improve RTD rates.
- Earlier ACLR may decrease the incidence of concomitant meniscal procedure and degree of meniscal injury sustained.
- To optimize patient care and improve likelihood of RTD, it is crucial to promptly evaluate and refer all suspected ACL injuries to physical therapy and orthopedic surgery.

Thank You

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