High Failure Rates of Concomitant Periprosthetic Joint Infection And Extensor Mechanism Disruption

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Abstract

Introduction: Patients presenting with both chronic periprosthetic joint infection (PJI) and extensor mechanism disruption (EMD) pose a significant challenge. As there is little in the literature regarding outcomes of patients with concomitant PJI and EMD, we performed a multicenter study to evaluate the outcomes.

Methods: Sixty patients with concomitant diagnoses of PJI and EMD were evaluated from 5 institutions. Patient demographics, presentation type, surgical management and outcomes including recurrent infections, final surgery and ambulatory status were documented.

Results: Fifty-three of 60 patients had an attempted extensor mechanism reconstruction/repair (EMR) of which 12 (23%) were successful, averaging 3.5 (range 2-7) intervening surgeries. Forty-one patients (77%) were considered failures with recurrence of infection as most common failure (80%); 26 ended in fusion, 10 in above knee amputation, 3 with chronic resection arthroplasty and 2 with chronic spacers/EMD. Seven patients had no attempt at EMR but proceeded directly to fusion (n=6) or amputation (n=1). There was no statistical difference between groups that had success or failure of EMR in age, American Society for Anesthesiologists Physical Status Classification System, or Body Mass Index.

Conclusions: Our study demonstrates that concomitant EMD and PJI is a dreaded combination with poor outcomes regardless of treatment. Eradication of infection and reconstruction of the extensor mechanism often requires numerous surgeries and despite great effort often ends in failure. Consideration of early fusion or amputation may be preferable in some patients to avoid the morbidity and mortality of repeated surgeries.

Keywords: Infection, Extensor mechanism, fusion, amputation, failure

Level of Evidence: III

INTRODUCTION

Infection following total knee arthroplasty (TKA) remains one of the most dreaded and difficult complications to treat. The overall incidence of infection in the literature ranges between 0.5% to 2% for primary TKAs and 2% to 4% for revision TKAs.[1-4] In 2005, 16.8% of all revision TKAs in the United States of America were done because of infection and it is estimated that by the year 2030, 65% of all revision procedures will be performed because of infection.[5] While successful eradication of periprosthetic joint infection (PJI) has been reported in the range of 85-95%, the mortality associated with PJI is high.[6]

Disruption of the extensor mechanism is an infrequent, but catastrophic complication following TKA. Reports in the literature range from 1.4 to 3.2 percent.[7-10] Repair or reconstruction to the extensor mechanism disruption (EMD) is technically challenging. Multiple techniques have been described and inconsistent results in the literature with variable outcomes have been recorded.[11] A recent longitudinal study of patients treated with extensor mechanism reconstruction (EMR) using allograft demonstrated 69% of knees retained the allograft at a mean follow up of 68 months. However, the reoperation rate was high at 58% with the most common reason for reoperation being development of PJI at 26% .[12]

Patients presenting with both chronic PJI and EMD pose a significant challenge. Both conditions are rare and the combination of the two diagnoses is even more rare. Allograft or synthetic material used for reconstruction can create difficulty for infection eradication. Removal of the extensor mechanism to treat the PJI can create substantial functional disability. While in the past these complications were often treated with fusion,

functional limitations associated with arthrodesis have led many to attempt reconstruction/re-implantation in the hopes of maintaining greater function.[13, 14] To date there is little data in the literature to guide surgeons and patients on the outcomes of patients that end up with both of these devastating complications[12]. We performed a multicenter study to evaluate the outcomes of patients that have concomitant PJI and EMD. Our purpose was to evaluate the treatment strategies used and determine the outcomes, including functional status, of patients that present with these complications. In addition, we sought to determine risk factors for failure.

METHODS

We performed a multi-center retrospective review of patients with concomitant diagnoses of PJI and EMD regardless of management. A query of the 5 participating tertiary referral centers' databases (XXX, XXX, XXX, XXX, XXX including 16 surgeons) was completed to identify all patients with a diagnosis of PJI (996.66) and TKA removal (CPT 27385 and 27488) with keywords of Marlex, aortobifemoral, quad(riceps) rupture, patella(r) tendon rupture and disruption. Patients less than 18 years of age and native knees were excluded. Patients diagnosed with PJI and EMD but who did not have an attempt at EMR but rather underwent early AKA or knee fusion were included in the study for comparison of clinical outcome based upon number of surgeries, complication rates, and ambulation status at final outcome. These cases were not included in the "failure" rate of attempted extensor mechanism reconstruction.

Patient demographic data at time of index surgery for PJI/EMD was collected retrospectively and included: age at the date of surgery, sex, body mass index (BMI),

American Society for Anesthesiologists Physical Status Classification System (ASA score). The timing of the primary TKA, diagnosis of infection, diagnosis of EMD, infecting organism, and antibiotic resistance information was documented. Data was collected regarding the presentation of PJI in relation to the timing of the EMD. Additionally, presentation of PJI in relation to EMD was classified into the following groups for ease of analysis: Group A: EMD occurred first and then PJI subsequently; Group B: Concurrent EMD and PJI; Group C: PJI first and then EMD, thereafter. We also recorded the type of EMR (primary repair or reconstruction with augmentation with allograft, Marlex mesh, aortobifemoral endograft, etc.). If concurrent diagnoses of EMD and PJI on presentation, then we also noted surgical management such as two-stage exchange with EMR, arthrodesis, amputation, etc.

We documented presentation type, surgical management (i.e., two-stage exchange with EMR, arthrodesis, amputation) and outcomes including reoperation (number of operations to final outcome), recurrent infections, and final surgery and ambulatory status. Ambulatory status was noted as yes/no; if yes (household or community) and whether walking aide was required and what type (cane, crutches, walker, none).

We used the Musculoskeletal Infection Society (MSIS) diagnostic criteria [15]. This criteria defines that "PJI exists when either: There is a sinus tract communicating with the prosthesis; or a pathogen is isolated by culture from at least two separate samples obtained from the affected prosthetic joint; or three of the following five criteria exist: 1) Elevated serum erythrocyte sedimentation rate (ESR) and serum C-reactive protein (CRP) concentration, 2) Elevated synovial leukocyte count, 3) Elevated synovial neutrophil percentage (PMN 4) Isolation of a microorganism in one culture of

116 periprosthetic tissue or fluid, or 5) Greater than five neutrophils per high-power field in
117 five high-power fields observed from histologic analysis of periprosthetic tissue at ×400
118 magnification."

119 Diagnostic criteria for extensor mechanism disruption included evidence on
120 clinical exam of extensor lag (> 15 degrees) against gravity or more and radiographic
121 evidence of a displaced patellar fracture disrupting the longtitudinal patella, patella alta or
122 patella baja. In some cases advanced imaging was utilized to diagnose EMD.

123 Criteria for successful extensor mechanism reconstruction included clinical
124 evidence of extensor mechanism continuity and function, which included continuously
125 palpated tissue and an extensor mechanism lag of 15 degrees or less against gravity.

126 Criteria for successful eradication of PJI was determined using the Delphi method
127 described by Diaz-Ledezma[16]. The consensus definition of a successfully treated PJI
128 is: (1) infection eradication, characterized by a healed wound without fistula, drainage,
129 or pain, and no infection recurrence caused by the same organism strain; (2) no
130 subsequent surgical intervention for infection after reimplantation surgery; and (3) no
131 occurrence of PJI-related mortality (by causes such as sepsis, necrotizing
132 fasciitis). Chronic antibiotic suppression was used in some cases as morbidity and
133 mortality of recurrent infection would not be tolerated by patient risk factors including
134 age and comorbidities and surgical history.

135 A total of 60 patients (22 men, 38 women) met the inclusion criteria. The mean
136 age of the cohort was 66 years (range 38-83; SD 9.4). The mean BMI was 34 (range 21-
137 49; SD 6.8). Overall, ASA score was II in 18, III in 27, IV in three patients, and missing
138 for 12. Of the 60 patients, 31 presented with EMD first and subsequently developed PJI

(Group A), 17 patients presented with concurrent EMD and PJI (Group B), and 12 patients developed PJI first and then EMD later (Group C). Five of the 60 patients died during the course of treatment.

RESULTS

Seven of the sixty patients were treated with early above the knee amputation (AKA; n=1) or knee fusion (n=6) based upon comorbidities, soft tissue envelope, etc. We included these for analysis of ambulation and number of surgeries, we did not include them in analysis of failures of EMR as no attempt at reconstruction was made.

An attempt at EMR was made in 53 of the 60 patients. The types of EMR are listed in Figure 1. Overall 12 of the 53 patients (23%) had a successful reimplantation of their TKA, defined as presence of a functional and continuous extensor mechanism and no ongoing clinical evidence for PJI based on the defined criteria. The majority of those with a successful outcome (7 of 12) had prior EMD and repair/reconstruction and subsequently developed PJI (Group A) treated with a two-stage exchange reconstruction. These patients underwent an average of 3.5 surgeries (range 2-7) between diagnosis and last surgery.

Forty-one of fifty-three patients (77%) were considered failures and averaged five intervening surgeries (range 1-14). The primary mode of failure was recurrence of infection in 80% of patients (33/41), 8 for failed extensor mechanism reconstruction (20%). Of the failures, 26 ended in fusion, 10 in AKA, 3 patients were left with chronic extensor mechanism deficiency and two patients had retained chronic static spacers with unresolved EMD.

Outcomes of Group A:

Thirty-one patients were categorized into group A. Twenty-seven patients had either a reconstruction (23 pts) or an attempted primary repair (4 patients) of their EMD as their initial surgery and subsequently developed PJI. Four patients had no attempt at limb salvage and went directly to AKA (3 patients) or fusion (1 patient) and were not counted towards failure analysis.

Seven of twenty-seven patients (26%) had successful two-stage exchange and retention of their extensor mechanism. Of these seven patients, three remained on chronic suppression, three were not on chronic suppression and one had an unknown antibiotic status. Twenty of twenty-seven patients (74%) failed attempts at limb salvage with two-stage exchange and EMR. Eleven patients ultimately underwent knee fusion, four patient's had AKA, three had clinical failure and disruption of the EMR and remained on chronic antibiotics as treatment and two had retained chronic spacers.

Outcomes of Group B:

Seventeen patients were categorized into Group B, presenting with a concurrent PJI and EMD. Two patients from Group B had no attempt at limb salvage and went directly on to fusion and so were not included in failure analysis. The remaining 15 patients all underwent resection arthroplasty with placement of a static antibiotic spacer. One patient was left with a chronic spacer in place with no further surgery.

Seven patients had an attempt at primary repair of the EMD at resection or re-implantation. None of these were deemed to have a functioning extensor mechanism. Five had a fusion, one an AKA and one was left with a chronic spacer after multiple

irrigation and debridement's. Seven patients had attempted EMR at the time of reimplantation with allograft or synthetic material. Three had successful retention of TKA and functional EMR (two were maintained on chronic antibiotic suppression) and four failed due to persistent infection resulting in four fusions and two AKAs.

Outcomes of Group C:

Twelve patients presented with a recent history of PJI and subsequent EMD. The most common mechanism was a fall resulting in disruption of the patellar tendon. Eighty percent failed due to recurrence of infection. 15% had complete failure of the extensor mechanism repair and 2 patients (5%) had perarticular fractures resulting in need for arthrodesis. The prior treatment of the PJI included eight patients that had undergone a prior two-stage exchange with reimplantation and four patients that had an irrigation and debridement with polyethylene exchange. One additional patient, not included in failure analysis, had no attempt at repair and went directly to a knee fusion.

Of the 11 patients with EMD, 9 underwent EMR with either an allograft of synthetic material. Two of these EMR were successful at regaining functional extensor mechanism with minimal lag, no further infection, and required no additional surgery. Seven patients had recurrence of infection and subsequently underwent an arthrodesis (4 patients) or an AKA (3 patient). Two patients underwent a primary repair of the EMD, subsequent developed PJI, and had a resection and knee fusion.

We found no statistical associations with age, ASA, BMI or presenting category (Group A, B, C) between the group of patients that had successful eradication of infection and EMR versus those that failed either treatment of infection or had a failed EMR

(Table 1). However, the failure group appeared to have a higher rate of infection with resistant bacteria (MRSA) or polymicrobial infections.

Regarding functional status at latest follow-up of the 55 living patients (5 patients died during course of treatment), 15 (27%) of the patients are non-ambulators, 13 (24%) are homebound ambulators, and 27 (49%) were community ambulators. Of the 15 non-ambulators, 7 had an AKA, 6 had an arthrodesis, and 2 had an attempted EMR with chronic spacer. All of the homebound ambulators required the use of a gait aid and 18 of the 27 community ambulators required a gait aide. Only 9 of the 55 living patients in this series required no walking aide at latest followup.

DISCUSSION

Extensor mechanism disruption in the setting of periprosthetic joint infection is a rare but devastating combination. There is limited literature on this combination with most reports focused on the treatment of one and only addressing the other as a noted failure mechanism without details. The goal of infection management is to debride all questionable tissue and leave no foreign material. Direct repair of EMD has poor results and the bulk of the literature supports bringing in bulk allograft or synthetic tissue to reinforce or bridge questionable native tissue. [17-19]

Patellar tendon rupture after TKA). Therefore, in the setting of concurrent PJI and EMD, it is difficult to accomplish both goals in one surgical intervention. Historically, the option that was considered best for these patients was arthrodesis as recurrence of infection was thought to be high with the use of allograft reconstruction in

the setting of prior infection.[14] The overall results and patient satisfaction with knee arthrodesis are quite poor leading some to attempt EMR.[13]

The purpose of this multicenter study was to evaluate a cohort of patients that presented with PJI and EMD to evaluate the treatment strategies used and determine outcomes and functional status of patients that present with these complications. In addition, we sought to identify risk factors for success and failure. Our study found that of the 60 patients who met the inclusion criteria, over half (31 patients) presented with an EMD first and then PJI developed subsequently with attempted treatment of the EMD (Group A). This is not inconsistent with the prior literature of the ten major papers on reconstruction of EMD.[7, 8, 10, 12, 20-23] These papers report on a total of 196 patients and note that 12 were failures due to infection. Though treatment and outcomes were not always delineated in these studies, approximately half of these failures were noted to have had prior infection that had recurred and the other half appeared to have developed a first time infection as a result of the EMD.

We found that the concurrent diagnoses of infection and EMD was rather morbid; five of the 60 patients (12%) in our series died during the course of treatment. This was also found in several of the other sizable series (approximately 10%-20%).[20] Most of the failures in the literature appeared to either be treated with AKA or fusion when noted though several patients (similar to our cohort) were treated with chronic spacer retention, antibiotic suppression and bracing.[21, 23]

While we expected that infection would lower rates of successful EMR we were surprised that the success rate was as low as the 23% in our study. These patients also clearly endured much as they underwent an average of 3.5 intervening surgeries to

eradicate the infection and maintain a total knee with extensor function. 77% never did have a successful EMR but still averaged five intervening surgeries. We found no correlation between the type of surgery used to treat the infection and success or failure likely due to sample size. The majority of the successful EMR in our series outcome were from Group A (prior EMR and subsequently developed PJI) though this group was also the largest group in our series. Success in this group was possibly due to the fact that these knees already had a function extensor mechanism at the time of two-stage exchange reconstruction and did not need augmentation of further tissue in face of infection.

When comparing function in patients treated with EMR, AKA and fusion, the Knee Society Score and other outcome measures are not very valuable or equitable. However, ambulation is a barometer of both the quality of life in many patients' eyes as well as a reflection of independent function. We found that a third of our patients were not able to regain any meaningful ambulation while half were community ambulators, the majority of which needed some sort of walking aide. Fusion was the final surgical outcome in the majority of our series (32 patients), which made up the majority of the patients that were able to return to community ambulation. Only around half of the patients in this series returned to community ambulation and only half of these were able to ambulate without a walking aide.

Recurrence of infection was the most common mode of failure, re-occurring in 80% of attempts at joint salvage. While we hoped to identify patient characteristics associated with failure that would direct the surgeon's treatment towards a discussion of early fusion rather than reconstruction attempts, no such factors (age, ASA or BMI, etc.) were found statistically significant. Instead, we found only a trend in infections with

"resistant organisms" (MRSA, pseudomonas, and polymicrobial infections) seemed more common in the patients that failed EMR.

This study has both strengths and a number of limitations. A multicenter study allows us to pool together a larger group of patients with a very rare complication to assess treatment trends and outcomes that might otherwise have not be possible with very small numbers from a single institution. However, multicenter studies do involve numerous surgeons with varying techniques and different decision making processes when approaching a similar problem. In addition, there are inherent limitation with the retrospective nature of this study in addition to the variability of patient presentations and treatment outcomes. We are not able to make specific recommendations as to the optimal treatment for patients presenting with PJI and EMD. The overall treatment outcomes were poor and this study design allows us identify the overarching problem and focus on the need for better treatment outcomes.

In conclusion, this study demonstrates that concomitant EMD and PJI is a dreaded combination with poor outcomes regardless of treatment. Eradication of infection and reconstruction of the extensor mechanism often requires numerous surgeries and despite great effort ends in failure the majority of the time, usually due to recurrent infection. Early consideration of fusion or amputation may be preferable to avoid the morbidity and mortality of repeated surgeries.

REFERENCES

[1] Della Valle, C., et al., *American Academy of Orthopaedic Surgeons clinical practice guideline on: the diagnosis of periprosthetic joint infections of the hip and knee.* Journal of Bone & Joint Surgery - American Volume, 2011. **93**(14): p. 1355-7.

[2] Mihalko, W.M., et al., *Infection in primary total knee arthroplasty: contributing factors.* Instructional Course Lectures, 2008. **57**: p. 317-25.

[3] Rand, J.A., B.F. Morrey, and R.S. Bryan, *Management of the infected total joint arthroplasty.* Orthopedic Clinics of North America, 1984. **15**(3): p. 491-504.

[4] Trousdale, R.T. and A.D. Hanssen, *Infection after total knee arthroplasty.* Instructional Course Lectures, 2001. **50**: p. 409-14.

[5] Kurtz, S., et al., *Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030.* J Bone Joint Surg Am, 2007. **89**(4): p. 780-785.

[6] Berend, K.R., et al., *Two-stage treatment of hip periprosthetic joint infection is associated with a high rate of infection control but high mortality.* Clinical Orthopaedics and Related Research®, 2013. **471**(2): p. 510-518.

[7] Barrack, R.L., T. Stanley, and R.A. Butler, *Treating extensor mechanism disruption after total knee arthroplasty.* Clinical orthopaedics and related research, 2003. **416**: p. 98-104.

[8] Burnett, R.S.J., et al., *Extensor mechanism allograft reconstruction after total knee arthroplasty.* J Bone Joint Surg Am, 2004. **86**(12): p. 2694-2699.

[9] Emerson Jr, R.H., W.C. Head, and T.I. Malinin, *Reconstruction of patellar tendon rupture after total knee arthroplasty with an extensor mechanism allograft.* Clinical orthopaedics and related research, 1990. **260**: p. 154-161.

[10] LEOPOLD, M.S.S., et al., *High Rate of Failure of Allograft Reconstruction of the Extensor Mechanism After Total Knee Arthroplasty*†.* The Journal of Bone & Joint Surgery, 1999. **81**(11): p. 1574-9.

[11] Springer, B.D. and C.J. Della Valle, *Extensor mechanism allograft reconstruction after total knee arthroplasty.* The Journal of arthroplasty, 2008. **23**(7): p. 35-38.

[12] Brown, N.M., et al., *Extensor mechanism allograft reconstruction for extensor mechanism failure following total knee arthroplasty.* J Bone Joint Surg Am, 2015. **97**(4): p. 279-283.

[13] Gottfriedsen, T.B., H.M. Schrøder, and A. Odgaard, *Knee Arthrodesis After Failure of Knee Arthroplasty.* J Bone Joint Surg Am, 2016. **98**(16): p. 1370-1377.

[14] Hasselberg, H., et al., *Outcome of Knee Joint Arthrodesis as a Salvage Procedure After Periprosthetic Infection: An Analysis of 41 Patients.* International Journal of Orthopaedics, 2016. **3**(3): p. 571-576.

[15] Parvizi, J. and T. Gehrke, *Definition of periprosthetic joint infection.* The Journal of arthroplasty, 2014. **29**(7): p. 1331.

[16] Diaz-Ledezma, C., C.A. Higuera, and J. Parvizi, *Success after treatment of periprosthetic joint infection: a Delphi-based international multidisciplinary consensus.* Clinical Orthopaedics and Related Research®, 2013. **471**(7): p. 2374-2382.

[17] Browne, J.A. and A.D. Hanssen, *Reconstruction of patellar tendon disruption after total knee arthroplasty: results of a new technique utilizing synthetic mesh.* Journal of Bone & Joint Surgery - American Volume, 2011. **93**(12): p. 1137-43.

[18] Cadambi, A. and G.A. Engh, *Use of a semitendinosus tendon autogenous graft for rupture of the patellar ligament after total knee arthroplasty. A report of seven cases.* Journal of Bone & Joint Surgery - American Volume, 1992. **74**(7): p. 974-9.

[19] Rand, J.A., B.F. Morrey, and R.S. Bryan, *Patellar tendon rupture after total knee arthroplasty.* Clin Orthop Relat Res, 1989(244): p. 233-8.

[20] Emerson Jr, R.H., W.C. Head, and T.I. Malinin, *Extensor mechanism reconstruction with an allograft after total knee arthroplasty.* Clinical orthopaedics and related research, 1994. **303**: p. 79-85.

[21] Nazarian, D.G. and R.E. Booth Jr, *Extensor mechanism allografts in total knee arthroplasty.* Clinical orthopaedics and related research, 1999. **367**: p. 123-129.

[22] Browne, J.A. and A.D. Hanssen, *Reconstruction of patellar tendon disruption after total knee arthroplasty.* J Bone Joint Surg Am, 2011. **93**(12): p. 1137-1143.

[23] Busfield, B.T. and M.D. Ries, *Whole patellar allograft for total knee arthroplasty after previous patellectomy.* Clinical orthopaedics and related research, 2006. **450**: p. 145-149.

Figure Legend

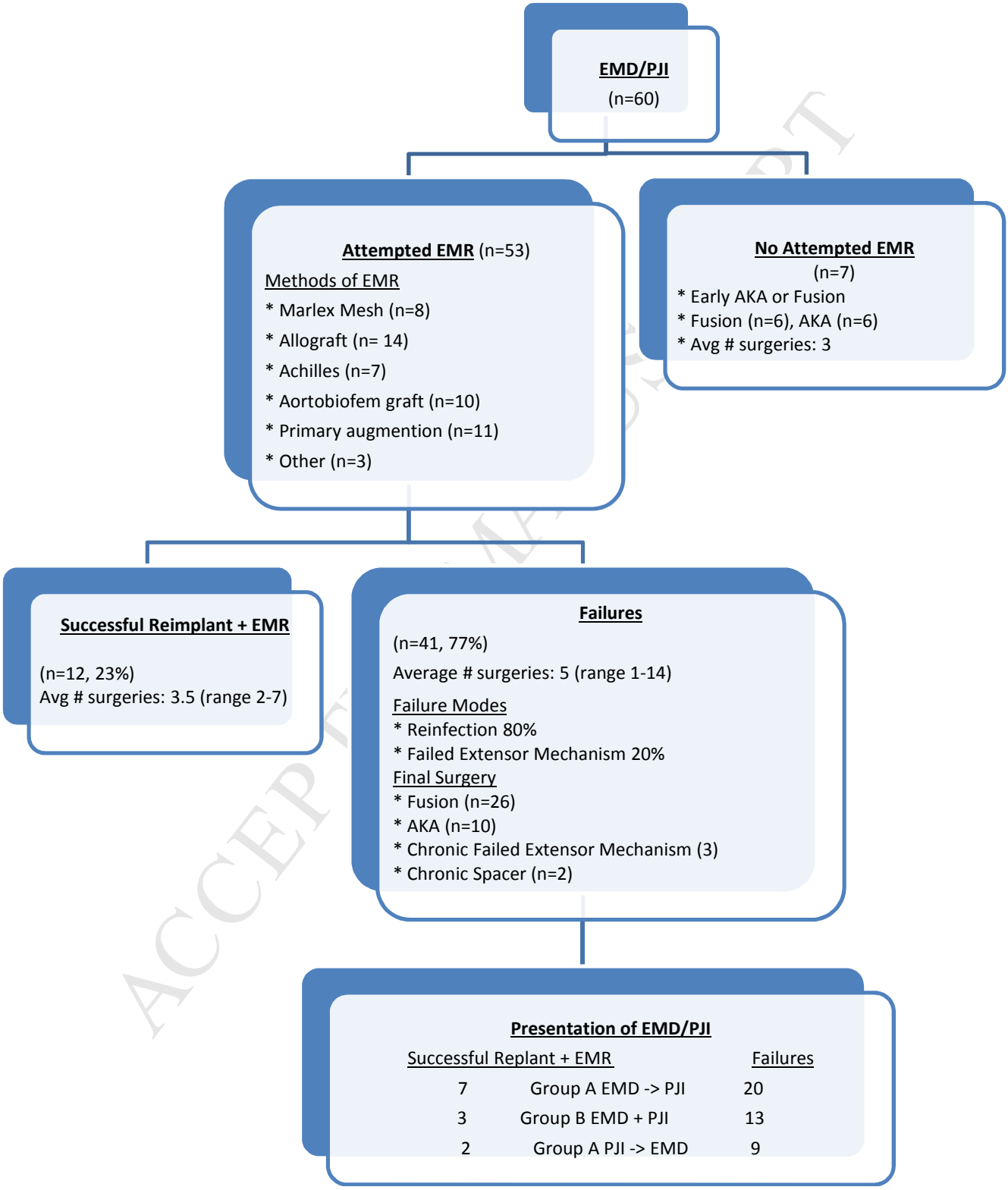
Figure 1: Attempted Extensor Mechanism Reconstruction Results

Table 1: Factors Associated with Failure Versus Success

	Re-implants & EMR (n=12)	Fusion or AKA (n=48)	P-Value
Age	67 years (55-76 years)	66 years (38-83 years)	.91
ASA			
I	0	0	.99*
II	3	15	
III	5	21	
IV	0	3	
BMI	33 (21-49)	34 (23-49)	.80

* The p-value was derived using a Fishers Exact Test. ASA was collapsed into two categories by combining ASA I and II versus III and IV.

Figure 1


EMD/PJI
(n=60)
Attempted EMR (n=53)
Methods of EMR
* Marlex Mesh (n=8)
* Allograft (n= 14)
* Achilles (n=7)
* Aortobiofem graft (n=10)
* Primary augmention (n=11)
* Other (n=3)
No Attempted EMR
(n=7)
* Early AKA or Fusion
* Fusion (n=6), AKA (n=6)
* Avg # surgeries: 3
Successful Reimplant + EMR
(n=12, 23%)
Avg # surgeries: 3.5 (range 2-7)
Failures
(n=41, 77%)
Average # surgeries: 5 (range 1-14)
Failure Modes
* Reinfection 80%
* Failed Extensor Mechanism 20%
Final Surgery
* Fusion (n=26)
* AKA (n=10)
* Chronic Failed Extensor Mechanism (3)
* Chronic Spacer (n=2)
Presentation of EMD/PJI
Successful Replant + EMR
Failures
7 Group A EMD -> PJI 20
3 Group B EMD + PJI 13
2 Group A PJI -> EMD 9