Contemporary Surgical Trends in the Management of Symptomatic Meniscal Tears among United States Military Servicemembers from 2010 to 2015

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Abstract

The purpose of this investigation is to report on trends over time in the treatment of meniscal pathology among military orthopaedic surgeons, as well as to evaluate the impact of patient demographics and concomitant procedure on the type of meniscal procedure performed. We performed a retrospective analysis of all active-duty United States military servicemembers who underwent a meniscal procedure from 2010 to 2015 within the Military Health System. Patient demographics and surgical variables were extracted from the electronic medical record. Treatments were categorized by location and by type of intervention (i.e., repair or debridement). Chi-square and linear regression analyses were performed to identify temporal trends in meniscal procedures and factors that were correlated with the type of meniscal procedure performed. Out of 29,571 meniscal procedures analyzed, partial meniscectomy was performed in 81.3% ($n = 24{,}343$) of cases, meniscal repair in 20.3% ($n = 6{,}073$), and meniscus allograft transplantation (MAT) in 0.7% ($n = 206$). The rates of debridement, repair, and concomitant surgeries did not demonstrate any significant temporal trends, whereas MAT demonstrated a significant decrease in overall utilization. Nearly two-thirds of all meniscal procedures were performed in the medial compartment. MAT occurred equally between the medial and lateral compartments. Lateral meniscal lesions demonstrated significantly higher rates of debridement. With each year of advancing age, there was a 3.7% increasing likelihood of meniscectomy and 6.5% decreasing likelihood of repair. Females were more likely to undergo meniscal repair than males. Patients in the military population were more likely to undergo meniscal repair compared with previously reported rates in the civilian population. In this physically active cohort of nearly 30,000 military patients, 1 in 5 meniscal tears were treated with meniscal repair. Meniscal repairs were performed at a higher rate for all age groups compared with previously reported rates in the civilian population. Further research is required to elucidate the causative factors behind these differences and the effect on postoperative outcomes.

Level of Evidence: IV, cross-sectional study.

Keywords
- meniscus
- military
- meniscectomy
- repair
- ACL

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Meniscal tears occur with a greater reported incidence among active-duty United States (US) military servicemembers (8.27 per 1,000 person-years) than the general population (range, 0.33–0.74 per 1,000 person-years).[1] The difference in rates of meniscal injury between the general population and active-duty servicemembers is likely attributable to the physically demanding occupational requirements, including wearing body armor, carrying load-bearing equipment, and participating in daily physical fitness activity. Musculoskeletal injuries, including meniscal tears, are among the leading causes for combat evacuation and discharge due to prolonged disability or inability to perform military-specific functions.[1,2]

A variety of treatment options for meniscal pathology exists including meniscectomy, meniscal repair, and meniscal allograft transplantation (MAT). While recent trends from the American Board of Orthopaedic Surgery Certification Examination Database 2004 to 2012 reported by Parker et al[3] demonstrate a decrease in utilization in recent years, arthroscopic meniscectomy continues to be the most common surgical intervention for meniscal pathology.[3] Given recent advances in meniscal repair techniques and increasing evidence for favorable outcomes in a young, healthy population, the indications for meniscal repair are expanding.[4,5] However, the effect of evolving, evidence-based guidelines on the practice patterns of orthopaedic surgeons remains to be characterized.

While the recent reports by Parker et al[3] and Abrams et al[6] have outlined the trends in meniscal procedures within a general population, the military population represents a unique, physically active patient subset that may be better suited for repair techniques. This investigation sought to report trends in meniscal procedures among military orthopaedic surgeons and to evaluate the impact of patient demographics and concomitant procedure on the type of meniscal operation performed. We hypothesized that (1) repair procedures would occur with greater frequency among servicemembers younger than 35 years old, and (2) repair procedures in all age groups were being increasingly performed in the setting of concomitant ligamentous or realignment procedures.

Methods

Following Institutional Review Board (IRB) approval, a retrospective analysis of all triservice active-duty United States military servicemembers undergoing meniscal cartilage procedures in a military treatment facility (MTF) or networked civilian facility between January 1, 2010 and December 31, 2015 was conducted using the Military Health System Management Analysis and Reporting Tool (M2). The M2 data system has been previously used to investigate epidemiology and outcomes for a multitude of procedures including but not limited to high tibial osteotomy (HTO), MAT, and tibial tubercle osteotomy (TTO).[7–9]

Records were extracted from the electronic medical record using Current Procedural Terminology (CPT) codes: 29880–arthroscopy, knee, with meniscectomy (medial AND lateral); 29881–arthroscopy, knee, with meniscectomy (medial OR lateral); 29882–arthroscopy, knee, surgical, with meniscus repair (medial OR lateral); and 29883–arthroscopy, knee, surgical, with meniscus repair (medial AND lateral). Patient demographic information and procedure-specific data were included for analysis. Patients who were not active-duty at the time of their injury or who were younger than 18 years old at the time of their procedure were excluded. Procedures were separated by year and classified by type of intervention: MAT, meniscal repair with debridement, meniscal repair without debridement, or debridement alone. Procedures were also classified by anatomic location: medial meniscus, lateral meniscus, or both. Chi-square analysis was performed comparing meniscus repair procedures by age range (by 10-year increments starting at less than 25 years up to 55–64 years) in the military population to that of the general population as reported by Abrams et al.[6]

All analyses were conducted using SPSS software (IBM Corp. Released 2013, IBM SPSS Statistics for Windows, Version 22.0, Armonk, NY). Chi-square and linear regression analyses were performed to analyze temporal trends for the meniscal procedures and concomitant surgeries. The chi-square test was also used to compare the percentage of meniscal procedures across lesion laterality. In addition, logistic regression analysis was used to test the effect of demographic variables on the presence of the meniscal procedures, with the odds ratio (OR) and corresponding 95% confidence interval (CI) reported. The rates of meniscal repair in patients 35 years of age or older were compared with the rates of repair in patients younger than 35 years old using a two-sided Fisher's exact test. For all statistical analyses, a p-value of less than 0.05 was deemed significant for this study.

Results

A total of 29,571 meniscal procedures were documented over the study period. Partial meniscectomy was the most commonly performed procedure, accounting for 81.3% ($n = 24{,}343$) of total procedures (►**Table 1**). Medial and/or lateral meniscal repair was performed in 20.3% ($n = 6{,}073$) of cases, and MAT comprised only 0.7% of cases ($n = 204$). The majority of patients who underwent MAT was under 40 years of age (93%) and involved in Army or Marine Corp service (88.6%). Nearly two-thirds of all meniscal procedures were performed on the medial meniscus, with 63.2% of all debridement procedures and 63.9% of all repair procedures occurring in the medial compartment (►**Table 2**). Meniscal debridement was utilized in 81.0% of the analyzed cases in the medial compartment. Meniscal debridement was utilized in 83.1% of cases in the lateral compartment, a significantly higher rate of utilization than in the medial compartment ($p < 0.0001$). MAT represented a minority of the procedures performed and was utilized at equal rates between medial and lateral compartments (0.5% vs. 0.5%, respectively; $p = 0.68$). Anterior cruciate ligament (ACL) reconstruction was the most commonly performed concomitant procedure with a rate of 28.1% (►**Table 3**). Other

Table 1 Descriptive statistics and odds ratios

	Total, *n* (%)	MAT	OR (95% CI) *p*-Value	MMD OR LMD, *n* (%)	OR (95% CI), *p*-Value	MMD AND LMD, *n* (%)	OR (95% CI) *p*-Value	MMR OR LMR, *n* (%)	OR (95% CI) *p*-Value	MMR AND LMR, *n* (%)	OR (95% CI) *p*-Value
Gender											
Male	26,604 (90.1)	183 (89.7)	0.95 (0.61, 1.50) 0.8381	19,123 (90.6)	1.18 (1.09, 1.29) < 0.0001	2,595 (90.4)	1.04 (0.91, 1.19) 0.5523	4,767 (88.2)	0.78 (0.71, 0.86) < 0.0001	529 (89.8)	0.96 (0.74, 1.26)0.7910
Female	2,913 (9.9)	21 (10.3)	Referent	1,991 (9.4)	Referent	274 (9.6)	Referent	639 (11.8)	Referent	60 (10.2)	Referent
Total (*n*)	29,517	204		2,1114		2,869		5,406		589	
Age											
< 20	728 (2.5)	4 (1.9)	Referent	432 (2.0)	Referent	55 (1.9)	Referent	230 (4.2)	Referent	32 (5.4)	Referent
20–29	12,392 (42.0)	122 (59.8)	1.80 (0.66, 4.89)0.2489	8,123 (38.5)	1.30 (1.12, 1.52) 0.0006	1,101 (38.4)	1.19 (0.90, 1.58), 0.2192	3,129 (57.9)	0.73 (0.62, 0.86) 0.0001	329 (55.9)	0.59 (0.41, 0.86) 0.0058
30–39	9,126 (30.9)	64 (31.4)	1.28 (0.46, 3.52) 0.6347	6,719 (31.8)	1.91 (1.64, 2.23) < 0.0001	895 (31.2)	1.33 (1.01, 1.77) 0.0483	1,466 (27.1)	0.41 (0.35, 0.49)< 0.0001	146 (24.8)	0.35 (0.24, 0.52) < 0.0001
40–49	6,201 (21.0)	12 (5.9)	0.35 (0.11, 1.09) 0.0704	4,984 (23.6)	2.81 (2.39, 3.30) < 0.0001	666 (23.2)	1.47 (1.11, 1.96), 0.0081	518 (9.6)	0.20 (0.17, 0.24) < 0.0001	75 (12.7)	0.27 (0.18, 0.41) < 0.0001
50+	1,070 (3.6)	2 (1.0)	0.34 (0.06, 1.86)0.2123	856 (4.1)	2.74 (2.22, 3.38) < 0.0001	152 (5.3)	2.03 (1.47, 2.80), < 0.0001	63 (1.2)	0.14 (0.10, 0.18) < 0.0001	7 (1.2)	0.14 (0.06, 0.33) < 0.0001
Total (*n*)	29,517	204		21,114		2,869		5,406		589	

Abbreviations: CI, confidence interval; MAT, meniscal allograft transplantation; MMD/LMD, medial meniscal debridement/lateral meniscal debridement; MMR/LMR, medial meniscal repair/lateral meniscal repair; OR, odds ratio.

Table 2 Laterality

	Number of medial procedures	Number of lateral procedures	*p*-Value[a]
CPT 29868, meniscal allograft transplantation	98 (0.5%)	57 (0.5%)	0.68
CPT 29881, medial OR lateral meniscectomy	12,880 (67.9%)	7,495 (63.4%)	< 0.0001
CPT 29880, medial AND lateral meniscectomy	2,493 (13.1%)	2,328 (19.7%)	< 0.0001
CPT 29882, medial OR lateral meniscal repair	3,599 (19.0)	2,032 (17.2%)	< 0.0001
CPT 29883, medial AND lateral meniscal repair	483 (2.6%)	442 (3.7%)	< 0.0001
Total number of cases	18,973	11,818	
Meniscectomy	15,373 (81.0%)	9,823 (83.1%)	< 0.0001
Repair	4,082 (21.5%)	2,474 (20.9%)	0.2262

Abbreviation: CPT, Current Procedural Terminology.
[a]*p*-Value for chi-square test.

concomitant procedures included marrow stimulation (6.2%), osteochondral autograft transfer system (OATS) (0.44%), and osteochondral allograft transplantation (OCA) (0.42%).

Analysis of demographic data demonstrated a 3.7% increasing likelihood of meniscectomy and 6.5% decreasing likelihood of meniscal repair with each year of increasing age ($p < 0.0001$). Likewise, the proportion of meniscectomy procedures increased with age, while the proportion of patients undergoing meniscal repair procedures decreased with age (►**Fig. 1**). Males were more likely to undergo meniscal debridement than females (OR: 1.18, 95% CI: 1.09–1.29, $p < 0.0001$) and less likely to undergo meniscal repair (OR: 0.78, 95% CI: 0.71–0.86, $p < 0.0001$) (►**Table 1**). Advancing chronological age was associated with a 6% decreased likelihood per year of undergoing MAT. Patients younger than 35 years were significantly more likely to undergo meniscus repair procedures than patients 35 years or older ($p < 0.0001$) (►**Fig. 1**).

Table 3 Number and frequency of concomitant procedures

Concomitant procedure	Number (%)
Anterior cruciate ligament reconstruction: CPT code 29888	8,293 (28.10)
Tibial tubercle osteotomy: 27455 OR 27418	46 (0.16)
High tibial osteotomy: 27457	38 (0.13)
Distal femoral osteotomy: 27450	5 (0.02)
Chondroplasty: 29886 OR Chondroplasty: 29877	844 (2.9)
Chondroplasty ± Microfracture: 29879	1,836 (6.2)
Scope autograft OATS: 29866	98 (0.33)
Open autograft OATS: 27416	32 (0.11)
29867 Scope allograft OATS	90 (0.30)
27415 Open allograft OATS	35 (0.12)
ACI: 27412	14 (0.05)

Abbreviations: ACI, autologous chondrocyte implantation; CPT, Current Procedural Terminology; OATS, osteochondral autograft transfer system.

During the analyzed time frame (2010–2015), the rates of isolated meniscal debridement (either medial or lateral) were not significantly different between years ($p = 0.246$) (►**Fig. 2**). Rates of isolated meniscal repair were significantly different between years ($p = 0.0025$) but did not demonstrate any significant trend over the analyzed time frame ($r^2 = 0.04 \pm 0.28, p = 0.889$). MAT demonstrated a small but significant decrease in overall utilization ($-0.06 \pm 0.02, p = 0.018$). Additionally, rates of concomitant ACL reconstruction during any meniscal procedure were significantly different between years ($p = 0.041$) but did not demonstrate any significant increase in utilization over the analyzed time frame ($r^2 = 0.423 \pm 0.179$, $p = 0.077$). Rates of concomitant HTO were significantly different between years ($p = 0.2053$) but did not demonstrate a significant increase over time ($0.017 \pm 0.02, p = 0.441$).

Analysis of meniscus repair procedures between the military cohort and the general population as reported by Abrams et al[6] demonstrated a significantly higher proportion of meniscal repair procedures for all age ranges in the military population ($p < 0.0001$) (►**Table 4**). In comparison to their civilian counterparts, military orthopaedic surgeons repaired meniscal tears at a rate of 26.6% for patients under 35 years old, 1.5 times the rate demonstrated in the general population. Additionally, military orthopaedic surgeons repaired meniscal tears at a rate of 11.0% in patients 35 years of age or older, 5 times the rate of meniscal repairs in this similar age group in the general population.[6]

Discussion

The current investigation characterizes the trends in surgical treatment of meniscal pathology among a predominantly young, physically active military population. A significantly higher number of all meniscus procedures, except for MAT, were performed on the medial meniscus in this population. Females were significantly more likely to undergo meniscus repair, while males were significantly more likely to undergo

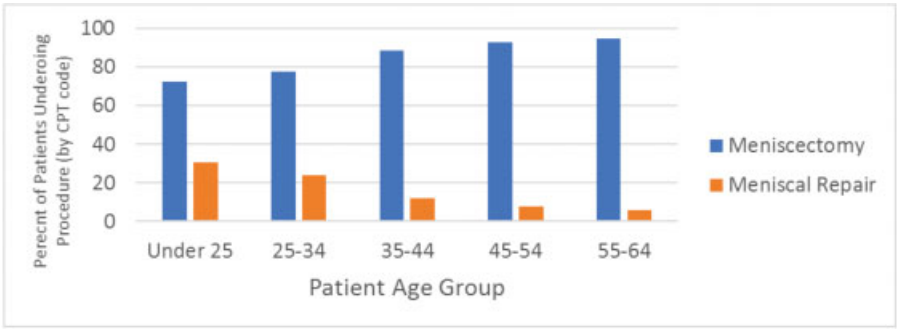

Fig. 1 Percentage of patients undergoing meniscectomy versus meniscal repair stratified by age group.

debridement. On regression analysis, there were no significant temporal trends in the frequency of meniscus procedures. The most notable finding was that military patients of all age ranges were significantly more likely to undergo meniscal repair than the general population ($p < 0.0001$).[6]

Others have recently evaluated trends in meniscus surgery in general populations utilizing the PearlDiver Patient Record Database (PearlDiver Inc, Fort Wayne, IN), which is one of the largest national patient record databases.[6,10]

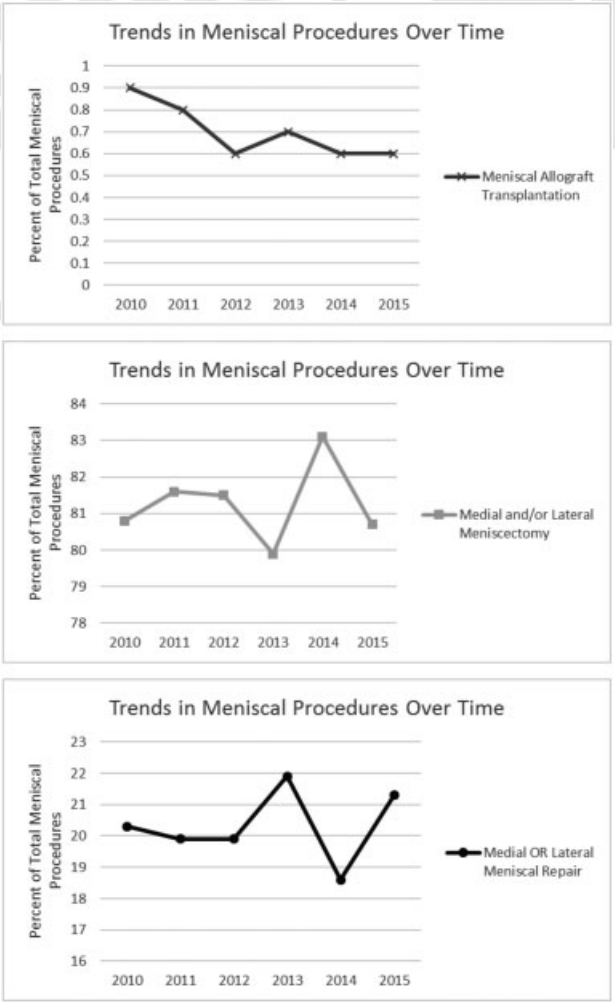

Fig. 2 Trends in meniscal procedures by year.

Montgomery et al[10] reported a significantly higher proportion of meniscectomy procedures in the medial compartment as compared with the lateral compartment. There were no significant temporal changes in the proportion of medial, lateral, or bicompartmental meniscectomies. Additionally, meniscectomy procedures were more commonly performed in older patients, most notably over age 40 (OR 2.81 for 40–49 years, 2.74 for those 50 years and older). Abrams et al[6] demonstrated similar results in their analysis of the PearlDiver Database noting the highest incidence of meniscectomies to be in patients 45 to 54 years of age ($p = 0.002$). This study demonstrates similar findings in a military population, with a significantly greater frequency of medial versus lateral meniscal procedures and no significant trends over time in the frequency of meniscectomies. Together, these studies suggest that despite growing evidence on the chondroprotective effects of meniscal repair for large, peripherally located meniscal tears, surgeon practice patterns for managing meniscal pathology have not demonstrated any significant change over time.

This study supports previous findings that meniscectomy has been the preferred treatment for older patients. This investigation also supports previous findings that meniscal repair is more likely to be performed in younger patients, specifically in those younger than 35 years old. These results are similar to the higher rates of meniscal repair reported by Abrams et al[6] in a subset of patients younger than 25 years old ($p < 0.001$) and by Montgomery et al[10] for a patient subset between 10 and 19 years old ($p < 0.0001$). In this study, increasing age was negatively correlated to the likelihood of undergoing meniscal repair. Many factors likely contribute to these age-related trends. Younger, physically active patients are more likely to suffer traumatic meniscal tears, whereas older patients more commonly have degenerative or complex morphology. Traumatic tears often occur in patterns amenable to repair, such as with bucket-handle tear, and improved return to preinjury activity level has been shown with repair rather than resection of sizable peripheral meniscal tears.[11] Degenerative meniscal tears, which become more likely with increasing age, are generally complex tears which may not be reparable.[12] Additionally, older patients have demonstrated decreased overall healing potential, and specifically, complex, degenerative tears may lack the adequate blood supply that governs the healing

Table 4 Comparison between military population and general population[6]

	Military population			General population (Abrams et al, ►Table 1)			
Age	Not repaired (%)	Repaired (%)	Total	Not repaired (%)	Repaired (%)	Total	*p*-Value
Under 25	4,948 (69.66)	2,155 (30.34)	7,103	35,360 (75.37)	11,555 (24.63)	46,915	< 0.0001[a]
25–34	7,971 (75.90)	2,531 (24.10)	10,502	32,278 (87.05)	4,800 (12.95)	37,078	< 0.0001[a]
35–44	7,549 (87.76)	1,053 (12.24)	8,602	73,337 (94.78)	4,039 (5.22)	77,376	< 0.0001[a]
45–54	2,827 (92.17)	240 (7.83)	3,067	128,791 (98.25)	2,300 (1.75)	131,091	< 0.0001[a]
55–64	229 (94.24)	14 (5.76)	243	114,896 (99.11)	1,028 (0.89)	115,924	< 0.0001[a]
Total	23,524	5,993	29,517	384,662	23,722	408,384	

Note: All *p*-values shown are for chi-square test.
[a]For each age group, there is a significantly higher percentage of meniscus repair procedures between the currently investigated military population compared to the civilian population presented by Abrams et al.[6]

potential of the tissue.[6,13–16] When a reparable, well-perfused meniscal tear exists, preference is given to meniscal repair rather than resection given the chondroprotective effects of the meniscus.[17] The medial meniscus, in particular, disperses axial forces into hoop stresses, supporting up to 70% of load during normal gait; reduction of the medial meniscus through meniscectomy results in increased joint contact pressures, reportedly as great as 100 to 350%.[15,18,19] The potential for future development of osteoarthritis after meniscectomy is likely a contributing factor in the higher rate of meniscal repairs in younger patients. Notably, lateral meniscectomy has been shown to be associated with longer time to return to preinjury activity levels in high-level athletes.[20] This information is concerning given the increased prevalence of lateral meniscectomies versus repair as compared with medial meniscectomies versus repair. This higher rate may be attributable to injury patterns in our population with lateral meniscal tears occurring in patterns that are less amenable to repair.

An interesting finding from this study is the higher rate of meniscal repair in all age groups from a military population compared with the general population. Specifically, military orthopaedic surgeons were five times more likely to repair meniscal tears in patients older than 35 years of age.[6] The differential rates of repair between these two populations are likely secondary to the higher rates of acute, traumatic meniscal tear in the military.[1] Additionally, a desire to facilitate sustainable return to a physically demanding occupation may drive a preference to more meniscus-preserving treatment in a military population, as meniscal repair has shown improved rates of long-term return to preinjury activity level compared with meniscectomy.[11] A previous investigation demonstrated that 81.5% of servicemembers are able to return to active duty after meniscal repair; however, 34% of these servicemembers required permanent activity restrictions.[21] Our data did not report the type of meniscal tear encountered intraoperatively, and further research is necessary to support the assertion that these differential rates of meniscal repair are secondary to different patterns of meniscal injury.

When analyzing by gender, males were more likely to undergo debridement while females were more likely to undergo repair. These findings are consistent with previously reported sex-specific treatment patterns.[22] The reasons for this preference for meniscal repair versus resection in females is unclear, and further work needs to be done to identify any differences in medical decision-making or injury patterns governing this trend. In this study, males comprised up to 90% of patients undergoing meniscal procedures, which is reflective of the baseline active-duty demographic, as males make up 85% of the military population, with a slightly higher risk for males to undergo a meniscal procedure than females. This difference has also been demonstrated in general population studies showing that ~60% of meniscal procedures occurred in males, who account for ~50% of the general population.[6] The higher number of males undergoing meniscal procedures may be secondary to either increased susceptibility to meniscal injury in males or greater participation in high-injury risk activities (e.g., combat arms specialties). Further research may elucidate the factors associated with this difference.

Rates of concomitant HTO remained relatively unchanged in frequency over the study period despite its frequent utilization to help manage medial compartment chondral or meniscal pathology. Periarticular osteotomies have previously demonstrated success in a military population for chondroprotective indications, with return to duty without conversion to knee arthroplasty or knee-related discharge from service in > 70% of cases and with > 90% survival in HTO with MAT. Waterman et al[8] evaluated 202 patients undergoing HTO from 2003 to 2011 with 48 (23.7%) undergoing concomitant meniscal procedures. Eighteen of these

48 subjects underwent MAT. Increased survival with concomitant MAT and HTO supports utilization of concomitant realignment procedures with meniscal procedures when clinically appropriate.[8,23] However, further investigations into the outcomes of nontransplant meniscal procedures with concomitant realignment procedures are required.

The number of concomitant ACL reconstruction with meniscal procedures increased 48.3% in the general population from 2005 to 2011.[6] Meniscal tears that occur with ACL injury more often occur in reparable conformations and demonstrate higher rates of successful repair, possibly due to increased milieu of healing and inflammatory factors released.[13,24] The lateral meniscus is more commonly involved when meniscal injury occurs with ACL injury which may explain the high number of concomitant ACL procedures with lateral meniscal procedures reported in the literature.[25,26] Delay between ACL injury and ligament reconstruction increases the risk of medial meniscal tears because the increased tibial translation in an unstable knee can more than double the contact forces through the medial meniscus.[24–27] While the current investigation demonstrates an increased rate of concomitant ACL reconstruction over time, this did not reach significance. The difference between the trends in these rates in these two populations is likely secondary to increasing rates of ACL injury in the general population—often attributed to increased female participation in sports and the higher risk for ACL injuries in females.[28,29]

MAT is often considered a salvage procedure for symptomatic meniscal insufficiency. This investigation reports a small but significant decrease in the utilization of MAT over the analyzed time frame. This utilization may be reflective of the small number of high-volume surgeons facile with MAT within the military framework, as well as concerns about cost effectiveness and the potential for military retention and long-term knee function after MAT.[9] Frank and Cole[18] present a general overview of patients who should be considered for MAT in the general population: patients less than 50 years with a chief complaint of pain, body mass index (BMI) less than 35 kg/m^2, previous meniscectomy or nonviable meniscus state, normal or correctable alignment, ligamentous stability and intact articular cartilage with realistic expectations, and compliance with rehabilitation protocols. Many members of the military population fit these criteria, and the decrease in utilization of MAT is likely due to treatment goals within the military framework rather than changes in the population demographic. The rehabilitation protocol by Frank and Cole[18] allows for return to straight line running after 16 weeks and demonstrates a high survival rate in the general population. For high-level athletes, return to previous level of activity after MAT is variable, occurring in between 77 and 92% of studied cohorts; however, a lower number of physically active patients return to preinjury levels of activity at less than 1 year postoperatively.[30,31] This is crucial in the military setting because physical conditions are considered for medical disability discharge if the condition, treatment, and/or rehabilitation are expected to take greater than 12 months without return to occupational duties. A recent study demonstrated that, in a military cohort, ~22% of patients undergoing MAT underwent knee-related military discharge at a mean of 2.49 years postoperatively.[9] The decreasing rate of utilization of MAT in our study may reflect the difficulty in managing patients in the context of a military career. Improved patient selection, postoperative rehabilitation, and referral to subspecialty trained, high-volume surgeons may improve 1-year return to activity and overall retention rates following MAT in the military population; however, because return to high-impact and high-risk athletic activity is discouraged after MAT, it is likely that MAT will continue to be considered an option of last resort in the military population.

This large, physically active military cohort offers a cross-sectional analysis of trends in meniscal procedures among military orthopaedic surgeons that is distinct from prior analyses. However, certain limitations must also be acknowledged. Primarily, this investigation is limited by its retrospective nature, limitations within the M2 health care database, and extrapolation from CPT codes that, inherently, have indistinct characteristics. The M2 health care database is limited by variables reported, reliance on the medical record, and inability to confirm details about meniscal pathology such as configuration or chronicity. Because of these database limitations, tear characteristics (i.e., number, size, degree of involvement, and exact location), mechanical axis alignment, ligamentous status, prior interventions, and occupational demands were not accounted for in the analyses. The largest limitation of the M2 database is that it contains data from multiple different treatment centers representing independent treatment algorithms, and the rationale for surgical decision-making for repair versus debridement likely varied between surgeons. Lastly, no radiographic or clinical outcomes data were obtained. However, despite these limitations, this study provides valuable insight into the current patterns of treatment of meniscal pathology in a generally physically active population. The large number of patients examined from this population provides a comprehensive overview of treatment patterns for meniscal pathology in a military population.

Conclusion

In this high demand sample of nearly 30,000 military patients, only 1 in 5 meniscal tears underwent repair between 2010 and 2015, with an increasing rate of meniscal repairs demonstrated across this time frame. The incidence of MAT decreased over the analyzed time frame. There was no significant increase in the utilization of adjunctive ligament reconstruction and concomitant offloading osteotomy in association with treatment of meniscal pathology. In comparison to their civilian counterparts, these results demonstrated that military orthopaedic surgeons are repairing meniscal tears at a rate of 26.6% for patients under 35 years old, 1.5 times more than the general population and 5 times more meniscal tears in those over 35 years of age. This may reflect differing injury patterns or an increased awareness of the consequences of meniscal insufficiency in the high-demand, physically active military population.

Further research should investigate the reasons for differences in rates of meniscal repair in the military and civilian population and evaluate and compare the outcomes in these two populations.

Conflict of Interest
None.

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