Current practices and opinions of Northwest Ohio and Southeastern Michigan

AAOS members regarding anterior cruciate ligament reconstruction

and rehabilitation in athletes versus non-athletes

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Dedication

I would like to thank my parents for supporting me throughout the entire program. They have always supported and encouraged me to achieve my goal of becoming a physician assistant. I wouldn't have made it through without them.

I would like to thank my classmates for being so willing to help everyone in our class succeed. We never would have made it through alone, but we all succeeded by working together.

Finally, I would like to thank my future husband, Jason Beck, for making me laugh and smile each day for the past 27 months even during the most stressful times. Thank you for always loving and supporting me. I wouldn't have made it through without you!

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Introduction

Many anterior cruciate ligament ("ACL" or "cruciate") injuries will occur in the general United States population this year. For adolescents and young adults, the incidence of a cruciate ligament injury is 60.9 per 100,000 person-years. Additionally, adolescent and young adult females participating in moderate to strenuous physical activity have 2 times the risk of incurring a cruciate ligament injury than adolescent and young adult females who do not participate in moderate to strenuous physical activity. Likewise, adolescent and young adult males participating in moderate to strenuous physical activity have 1.5 times the risk than adolescent and young adult males not participating in moderate to strenuous physical activity. Furthermore, participating in competitive sports more than 4 times per week increases the risk for both of these groups. This group of athletically active adolescent and young adult females has an 8.5 times greater risk while a similar group of athletically active adolescent and young adult males has a 4 times greater risk of incurring a cruciate ligament injury than does the entire inactive U.S. population (Parkkari, Pasanen, Mattila, Kannus, & Rimpela, 2008). Therefore, in young, physically active and competitive populations, the higher and more strenuous the activity level, the higher the risk of suffering a severe cruciate ligament injury.

In addition to increasing the ACL injury rate, participating in strenuous activity and competitive sports also increases the injury severity, time-table, and performance expectations, for young athletes who are working to return to their sport following an ACL repair or reconstruction. According to Gobbi and Francisco (2006), athletes who reported difficulty resuming running and agility activities were much less likely to return to their sport following ACL reconstruction, while those who attained their previous speed and agility performance levels were much more likely to return to their previous overall sporting level. Another study

conducted by Kvist, Ek, Sporrstedt, and Good (2005) revealed those who did not return to their previous sporting level had a higher fear of re-injury than those who did return to a high level. Furthermore, Lee, Karim, and Chang (2008) cited knee instability and a fear of re-injury as the two main reasons young athletes either cannot, or do not, return to their previous activity levels. Therefore, restoring patients' knee stability and function, as well as their confidence in the integrity of their reconstructed knee, may both be equally important for returning to their sport.

In addition to athletes having higher postoperative performance expectations, participating in high-level, postoperative competition, indeed places higher demands on their reconstructed knees. Jerre et al. (2001) found that significantly more recreational athletes were able to return to their pre-injury activity level, than competitive athletes, when controlling for surgical technique, graft tissue type, and rehabilitation protocol. Other than level of competition, the study did not find any other significant differences between these two groups using both objective and subjective tests to determine knee stability, knee function, presence of any ACL ligament laxity, and the presence of anterior knee pain during activity (Jerre, et al.). This suggests that surgical technique, graft tissue type, and rehabilitation protocol may be important variables in how well competitive athletes are able to return to high-demand sports.

As a result of different performance expectations, psychological factors, and activity demands between competitive athletes and non-athletes following an ACL injury, orthopedic surgeons may need to manage their cases differently. For a competitive athlete, the surgeon must optimize the surgical technique and rehabilitation protocol to ensure the athlete reaches his peak performance level postoperatively. A non-athlete, on the other hand, may be content with increased knee stability and decreased pain following the reconstruction and rehabilitation period.

The surgeon must also decide whether or not to prescribe a knee brace for use during the rehabilitation period and for the athlete's return to sport or the non-athlete's return to daily activities. While the current literature does not support the use of a knee brace for either scenario following an ACL reconstruction, many surgeons continue to prescribe them (Harilainen & Sandelin, 2006; Harilainen, Sandelin, Vanhanen, & Kivinen, 1997; Hasan, 2004; McDevitt, et al., 2004; Risberg, Beynnon, Peura, & Uh, 1999)**.** Delay, Smolinski, Wind, and Bowman (2001) reported that 71% of orthopedic surgeons prescribed functional knee braces up to one year postoperatively. Two subsequent studies reported lesser percentages. Marx, Jones, Angel, Wickiewicz, and Warren (2003) found that 60% of orthopedic surgeons prescribe a brace for at least 6 weeks postoperatively, while 62% of surgeons recommend a brace indefinitely for sports postoperatively. In another survey, Decoster and Vailas (2003) found that the most important factor influencing an orthopedic surgeon's decision to prescribe a brace was the patient's sporting or activity level. However, a contrary study found that using a functional knee brace possibly decreases an athlete's postoperative performance level and further may not provide any more mechanical protection than a neoprene sleeve (Birmingham, et al., 2008; Wu, Ng, & Mak, 2001).

While these studies and others have examined the differences in orthopedic surgeons' management of ACL injuries regarding graft types, rehabilitation protocols, use of knee brace or neoprene sleeve, and time period before return to normal activities, no study has definitively examined the influence of a patient's high-stress sport or activity level on management of ACL injuries (Bradley, Klimkiewicz, Rytel, & Powell, 2002; Delay, et al., 2001; Marx, et al., 2003; Nyland, Caborn, Johnson, Moore, & Slone, 1998). Therefore, the purpose of this study is to survey the opinions of the Northwest ("NW") Ohio and Southeastern ("SE") Michigan members

of the American Academy of Orthopedic Surgeons ("AAOS"), to determine their current practice regarding preoperative management, surgical technique, and postoperative rehabilitation of ACL injuries in athletes versus non-athletes. This study will also survey the knowledge and attitudes of the same AAOS members regarding the use of knee braces for rehabilitation and return to sport.

Literature Review

Types of Grafts

There are three main tissue types available for use in ACL reconstructions: autografts, allografts, and synthetic grafts. Of the three major types, two forms of autografts, the patellar tendon and hamstring tendon, are most commonly used by orthopedic surgeons for ACL reconstructions (Bradley, et al., 2002; Campbell, 1998; Delay, et al., 2001; Marx, et al., 2003; Mirza, Mai, Kirkley, Fowler, & Amendola, 2000; Nyland, et al., 1998). Overall, in both athletes and non-athletes, the patellar tendon remains the most commonly used tissue type. Bradley et al. surveyed team physicians employed in the National Football League and found that 97% used the patellar tendon autograft for reconstructing acute ACL injuries. Another study conducted by Delay et al. found that 78% of all orthopedic surgeons preferred patellar tendon autografts. Furthermore, surgeons surveyed in this study cited patellofemoral pathology, open growth plates, and performing a revision ACL surgery as the most important factors in choosing the use of a hamstring tendon autograft instead of a patellar tendon autograft, as hamstring grafts were used in 57%, 65%, and 48% of these cases respectively. These surgeons did not cite sport participation as an important factor, as hamstring grafts were only used in 23% of male athletes and 33% of female athletes (Delay, et al.).

Although the patellar tendon remains the most common graft type used for ACL surgeries, evidence shows with implementation of the proper surgical technique, there appears to be no major objective or subjective outcome differences reported between the patellar or hamstring tendon autografts (Aune, Holm, Risberg, Jensen, & Steen, 2001; Gobbi, Mahajan, Zanazzo, & Tuy, 2003; Pinczewski, et al., 2007). The surgeon's first step towards implementing the proper hamstring tendon surgical technique is to choose an appropriate type of graft for the

individual patient. There are three main types for the surgeon to choose from. These include a double semitendinosus (ST) tendon, a double ST tendon plus a double gracilis tendon, or a quadruple stranded ST tendon. Muneta et al. (2007) and Siebold, Dehler, and Ellert (2008) found patients with the doubled stranded ST tendon hamstring grafts experienced more anterior ligament laxity than patients with the quadrupled ST stranded hamstring graft. However, studies comparing the quadruple stranded ST hamstring tendon with the patellar tendon have found no differences in ligament stability between the two (Gobbi, Tuy, Mahajan, & Panuncialman, 2003). Similarly, a randomized study comparing a double ST tendon plus a double gracilis to a patellar tendon-bone autograft found no differences in ligament stability between the two. However, they did find better functional performance with the hamstring graft than the patellar graft at 6 months, but not at 12 months, and decreased hamstring strength up until two years with use of the hamstring graft (Aune, et al.). These are all first-step considerations for the surgeon.

The second decision the surgeon must make regarding the surgical technique is the type of femoral and tibial fixation to be used during the procedure. The hamstring tendon's fixation method was previously inferior to the method used with the patellar tendon. However, introduction of a hamstring tendon fixation method that takes advantage of biologic bone-to-bone healing has made it comparable to the patellar tendon in terms of initial graft fixation strength (Scheffler, Sudkamp, Gockenjan, Hoffmann, & Weiler, 2002). This procedure involves harvesting two bone plugs; the first during the harvesting of the ST and the second during the creation of the tibial tunnel. During the surgical procedure these bone plugs are fixated in the femoral and tibial tunnels respectively (Gobbi, Tuy, et al., 2003). This improved surgical technique may cause hamstring tendons to be used more frequently in the future.

The improved surgical technique has lead to recent studies advocating the use of hamstring tendon autografts in a specific population of young athletes wishing to return to their previous sport. One study concluded that harvested hamstring tendon autografts, particularly ST tendons, have a lower incidence of donor site morbidity. This evidence has lead to recommendations that they be used in patients with previous patellar tendon pathology or in young athletes involved in sports associated with a high incidence of patellar tendinitis (Gobbi, Mahajan, et al., 2003; Gobbi, Tuy, et al., 2003).

Gobbi, Mahajan, et al. (2003) made this recommendation based on the results of a prospective clinical investigation conducted using a group of athletes. They compared the subjective and objective outcomes of ACL reconstructions using both a patellar tendon graft and a quadrupled bone-semitendinosus graft. The participants in the patellar tendon group did not experience differences from the semitendinosus group in terms of ligament laxity, knee satisfaction, or standard knee evaluation scores. However, at 12 months, the patellar tendon group demonstrated mild extensor deficit, while the semitendinosus group exhibited decreased flexor strength. The study also reported only 60% of all the athletes undergoing ACL reconstructions were able to return to their previous level of sporting activity postoperatively. Nevertheless, no significant differences in graft type were found among those athletes who returned to sport versus those who did not (Gobbi, Mahajan, et al.). Overall, the hamstring graft should not be recommended in all athletes, only in those who have a history of patellar tendon pathology or in those who wish to return to sports associated with patellar tendinitis. For other athletes who do not possess either of these characteristics, current practice is that surgeons may choose either the hamstring or patellar tendon autografts based on their personal preference.

Postoperative ACL Rehabilitation and Bracing

Rehabilitation following ACL surgery has changed considerably in the past 30 years. In the 1980's protecting the graft from excessive stress and strain was the top priority. One popular rehabilitation program from the 1980's consisted of five phases. The first phase lasted 12 weeks and allowed no movement of the reconstructed joint. The second phase lasted 24 weeks and allowed walking with the assistance of crutches before walking unassisted. The final three stages were geared toward building strength, stability and conditioning. Full weight-bearing was not allowed until the 16th week and return to activity was typically not allowed until 9 to12 months following surgery (Paulos, Noyes, Grood, & Butler, 1991).

Shelbourne and Nitz (1990) developed an accelerated rehabilitation program in the 1990's after noticing their patients who did not comply with their prescribed rehabilitation program, actually had better outcomes following ACL reconstruction that used a bone-patellar tendon-bone graft. This new program emphasized immediate full extension, immediate weight-bearing and initial flexion of 90 degrees postoperatively. Although immediate full weight-bearing was allowed with the use of a rehabilitation brace, they still encouraged first week bed rest except for necessary activities, such as bathroom use. Beginning with the second week, they allowed their patients to return to work or school. Between weeks 2 and 5, they added closed chain exercises to a patient's rehabilitation regimen. These closed chain exercises included performing knee bends, riding a stationary bike, doing lateral step-ups, and using a Stairmaster. Patients were allowed to return to sport specific activities after week 5 or when the quadriceps of their reconstructed knee was 65% the strength of their contra-lateral leg. They encouraged their patients to return to full sporting activities at their own pace, typically around 6 months postoperatively (Shelbourne & Gray, 1997; Shelbourne, Klootwyk, Wilckens, & De Carlo, 1995;

Shelbourne & Nitz). After 2 to 9 years of employing the accelerated ACL rehabilitation program, the researchers found long-term stability, low complications, return to full activity and a lower percentage of graft failures than with their previous program (Shelbourne & Gray).

The accelerated rehabilitation model first used by Shelbourne and Nitz (1990) has become the standard for most of the current postoperative ACL rehabilitation protocols (Aune, et al., 2001; Majima, Yasuda, Tago, Tanabe, & Minami, 2002; Muellner, Alacamlioglu, Nikolic, & Schabus, 1998). However, more recent research suggests that postoperative bracing following ACL reconstruction using a patellar tendon autograft may no longer be a necessary component of rehabilitation programs (Harilainen & Sandelin, 2006; Moller, Forssblad, Hansson, Wange, & Weidenhielm, 2001; Muellner, et al., 1998). Harilainen and Sandelin conducted a randomized prospective study following bone-tendon-bone patellar tendon ACL surgery and found no difference in terms of functional activity or knee stability at 2 and 5 years follow-up between a group of patients that wore a brace for 12 weeks postoperatively versus a group that did not wear a brace at all. Similarly, Möller et al. conducted a prospective randomized trial studying the use of rehabilitation braces for the first 6 weeks postoperatively following ACL reconstruction using a patellar tendon autograft. They found no differences between the brace and non-brace group in terms of ligament laxity, range of motion, knee stability and quality of life. While at 6 months the non-braced group had a higher activity level than the braced group, this difference was not seen at the 2 year follow-up (Moller, et al.)

Although studies have concluded that an accelerated rehabilitation program without the use of a postoperative brace is safe and effective following ACL reconstruction using a patellar tendon autograft, until recently fewer studies had examined this protocol following surgery with a hamstring tendon autograft. A recent controlled prospective study compared patellar tendon

and hamstring tendon autografts, both using an accelerated rehabilitation program without a brace for the study. The program was conducted by the same physical therapists for both graft types where the patients had been allowed to return to jogging after 6 weeks and to return to sport after 6 months. At 10 years follow-up, there were no differences in graft rupture rates, subjective results, range of motion or knee stability (Pinczewski, et al., 2007). Furthermore, another randomized study comparing a hamstring tendon versus patellar tendon autograft, also studied aggressive rehabilitation programs without use of a brace, and found no differences in knee stability or function between the two graft types at 2 years follow-up (Aune, et al., 2001).

As a result, using an accelerated rehabilitation program without a brace appears to be safe following either patellar or hamstring tendon autograft ACL reconstruction. Nevertheless, current hamstring tendon and patellar tendon rehabilitation programs still have one major difference. Following ACL reconstruction using a hamstring graft, physical therapists tend to shun aggressive hamstring exercises for the first 6 weeks, to avoid both patient discomfort and irritation of the muscle as it heals. Between weeks 6 and 8, light resistance exercises are typically begun, with no limitations placed on hamstring rehabilitation after week 8 (Wilk, Reinold, & Hooks, 2003).

Accelerated rehabilitation programs following ACL surgery using a hamstring tendon graft are slightly different than those using a patellar tendon graft, but overall both programs may be safely performed without the use of a postoperative brace. Furthermore, the accelerated program without a brace does not appear to affect a patient's functional outcome, knee stability, or slow down his return to activity. Therefore, accelerated rehabilitation programs without the use of a brace have been used safely and effectively in both athletes and non-athletes.

Functional Knee Braces and Athletic Performance

Functional knee braces are commonly prescribed by orthopedic surgeons for up to a year after ACL surgery to prevent re-injury of the reconstructed ACL during activity (Delay, et al., 2001). It has been suggested they prevent re-injury using two different mechanisms. First, they offer biomechanical protection by reducing anterior tibial loads and internal tibial torques that strain the ACL (Beynnon, et al., 1997; Fleming, Renstrom, Beynnon, Engstrom, & Peura, 2000). Second, some studies suggest they impact neuromuscular control by altering proprioception and postural control, although others disagree on this point (Beynnon, et al., 1999; Birmingham, et al., 2001; Ramsey, Wretenberg, Lamontagne, & Nemeth, 2003; Rebel & Paessler, 2001; Risberg, Beynnon, et al., 1999). Despite some evidence that functional knee braces may biomechanically protect the graft and impact neuromuscular control, other studies have shown they offer no protection against subsequent injury of a reconstructed ACL during activity, and further they may actually decrease performance level (Birmingham, et al., 2008; McDevitt, et al., 2004; Risberg, Holm, Steen, Eriksson, & Ekeland, 1999; Wu, et al., 2001).

Many studies have examined the biomechanical protection mechanism of functional knee braces. Beynnon et al. (1997) studied this topic by arthroscopically implanting a transducer on the ACL to examine the effects of functional bracing on ACL strain. Various directional loads that are known to produce ACL injuries were applied to the tibia in both a sitting and a standing position; they found the functional knee brace reduced the ACL strain caused by an anterior loading of the tibia in both the sitting and standing positions. It also decreased the ACL strain in the sitting position when internal and external torque forces were applied to the tibia (Beynnon, et al.).

However the application of the Bennyon et al. (1997) study to clinically relevant situations may be limited for two reasons. First, although the *directions* of forces used in this study have been known to cause ACL injuries during activity, the *strength* of forces applied were well below those experienced during contact sports. Second, the functional knee brace did not reduce ACL strain against rotational forces in the standing position, and these forces are frequently encountered during athletics (Fleming, et al., 2000). While this study showed a functional knee brace may protect an ACL from strain when subject to low anterior tibial loading forces during activity, it does not provide evidence of protection against stronger forces that are frequently encountered during athletics.

In addition to examining biomechanical protection from functional knee braces, other studies have explored their effect on neuromuscular response, including proprioception and postural control. Two studies concluded functional knee braces have a positive impact on certain aspects of neuromuscular control. Ramsey et al. (2003) examined the lower limb's neuromuscular response to a functional knee brace during a series of one-legged hops in 4 males with ACL deficient knees. Their results showed that the functional knee brace decreased activity of the bicep femoris muscle, but increased activity of the rectus femoris muscle. Typically this type of firing pattern should increase anterior tibial translation, but instead the subjects showed small reductions in anterior translation during the one-legged hopping. The authors hypothesized that the study participants experienced reductions in anterior translation because the functional knee brace alters proprioception: it increases afferent input to the central nervous system through brace-skin-bone input and alters the firing patterns of the knee stabilizing muscles. They concluded the body's natural proprioceptive and muscular control combined with the afferent

input provided by the brace has the ability to increase the ACL-deficient joint's stability (Ramsey, et al.).

Another study conducted by Rebel and Paessler (2001) examined the effect of functional knee braces on postural control in 25 patients after ACL reconstruction, hypothesizing that improved postural control would lead to changes in muscle firing patterns. They found the functional knee brace improved postural control during balancing activities, and also produced significant activity changes in the vastus medialis, vastus lateralis, biceps femoris, and gastrocnemius muscles. The authors concluded the coordination improvement seen with the functional knee brace may not only be attributed to changes in muscle activity patterns, but also to psychological factors; the brace increased the participants' confidence in their reconstructed knees, which lead to changes in the neuromuscular pattern and thus enhanced their coordination (Rebel & Paessler).

However, another study performed by Birmingham et al.(2001) produced results that contradicted the positive impact of functional knee braces on proprioception and postural control. They concluded that functional knee braces provide only a small and insignificant improvement in proprioception, and further that the more complex an activity, the less a functional knee brace contributes to improvement in postural control. As a result, a functional knee brace arguably has no contribution to improving coordination during athletic activity because as an activity becomes more complex, the overall natural somatosensory inputs increase and the small contribution made by the brace is insignificant (Birmingham, et al.). The studies conducted by Ramsey et al. (2003) and Rebel and Paessler (2001) used less complex activities to test coordination and proprioception, and therefore may not be clinically relevant in light of the results of the Birmingham et al. study.

Other studies have concluded there is no difference in ligament laxity, function, or activity level between those who wear functional knee braces for 1 to 2 years following ACL reconstruction, and those who do not (Birmingham, et al., 2008; McDevitt, et al., 2004; Risberg, Holm, et al., 1999). McDevitt et al. conducted a prospective, randomized, multicenter trial to specifically examine whether functional knee braces influence postoperative outcome in a young, active, homogenous population, and found functional knee braces had no clinical benefit for use during strenuous activity following ACL surgery for this group. Another prospective, randomized study by Risberg, Holm et al. not only concluded that functional knee braces had no clinical effect on knee function or joint stability, but also determined that participants who wear a functional knee brace for 1 to 2 years have decreased quadriceps strength when compared to those who only wear it for 3 months.

So in addition to not improving outcome following ACL reconstruction, functional knee braces may decrease performance levels. Wu et al. (2001) performed a cross-sectional comparative trial to compare the functional effects of a functional knee brace, a non-supportive (placebo) brace, and no brace, in patients following ACL reconstruction. The results showed both bracing conditions slowed running and turning speeds, and there was no overall difference in performance between the functional knee brace and the placebo, non-mechanically supportive brace. Therefore, they concluded that neither the prospective biomechanical nor neuromuscular effects of functional knee braces actually contributed to functional improvement (Wu, et al.).

Despite evidence that functional knee braces decrease athletic performance and/or have no benefit following ACL reconstruction, they may have a role in special circumstances. First, they may protect downhill skiers with prior ACL injury from subsequent injuries (Sterett, Briggs, Farley, & Steadman, 2006). Second, a specially designed brace with a knee extension constraint

used in recreational athletes. may prevent non-contact ACL injuries in sports (Yu, et al., 2004).

Finally, functional knee braces may provide more confidence in the reconstructed knee for return

to activity. One randomized controlled clinical trial comparing the effectiveness of neoprene

sleeve use versus functional knee braces following ACL reconstruction, found no objective

difference in outcome between the functional knee brace and neoprene sleeve, but did find the

group wearing the functional knee brace for return to activity had more confidence in the knee at

6 and 12 months than the neoprene sleeve group (Birmingham, et al., 2008). But follow-up

studies under alternative circumstances should be conducted on these topics to validate if the

functional knee braces may be protective for athletes in sports other than skiing, if all types of

functional knee braces will prevent non-contact ACL injures in recreational athletes, and if

increased confidence in the knee may have the detrimental effect of leading to increased injuries.

In summary, functional knee braces may not offer any biomechanical or neuromuscular

enhancements during activity, and also may not offer protective effects for the reconstructed

ACL (Birmingham, et al., 2008; Birmingham, et al., 2001; Fleming, et al., 2000; McDevitt, et al.,

2004; Risberg, Holm, et al., 1999). Furthermore, they may decrease performance level (Wu, et

al., 2001). While there may be a small role for their use in skiers and recreational athletes,

orthopedic surgeons may not have a clinically proven basis for prescribing functional knee

braces wholesale for athletes or non-athletes (Sterett, et al., 2006; Yu, et al., 2004). However,

studies have shown functional knee braces to increase some patients' confidence in the

reconstructed knee (Birmingham, et al., 2008). So in the case of a non-athlete who was made

aware the functional knee brace may not provide him actual protective effects and may decrease

his functionality still requests a functional knee brace, an orthopedic surgeon might consider

prescribing a functional knee brace for up to 1 year following ACL reconstruction; they have

been shown to offer psychological comfort for such patients restarting physical activity following surgery. But there is no existing, clinically proven benefit of prescribing functional knee braces for athletes returning to full competition who have completed a rehabilitation program and demonstrate recovered knee stability and strength.

Methods

NW Ohio and SE Michigan members of the AAOS were surveyed to determine their current practice regarding preoperative management, surgical technique, and postoperative rehabilitation of ACL injuries in athletes versus non-athletes and their knowledge and attitudes regarding the use of knee braces postoperatively. The potential participants and their addresses were located using the AAOS member directory on the AAOS website. All members with addresses within 50 miles of the "43614," University of Toledo Health Science Campus, zip code were to be asked to participate in the survey. The search produced 197 such AAOS members located in NW Ohio and SE Michigan, and surveys were mailed to all of these members. A cover letter explaining the purpose of the study, measures taken by the investigators to ensure confidentiality of the participants, and instructions to the potential participants regarding consent was included in the mailing. A self-addressed envelope was also included to help facilitate participation.

The survey was 20 questions in length and the questions were categorized: there were two questions assessing the opinions of preoperative and surgical management of athletes and non-athletes, four questions assessing opinions about the postoperative rehabilitation period of athletes and non-athletes, and three questions assessing opinions about the use of knee braces postoperatively and time to return to sport for athletes and non-athletes. Additionally, six questions assessed the knowledge and attitudes of the participants' knee brace use in their patients postoperatively. Finally, information regarding their surgical volume was requested. A local AAOS orthopedic surgeon analyzed the prospective survey for content and face validity.

Twelve surveys were undeliverable because of invalid or wrong addresses. Thirty-five orthopedic surgeons returned the surveys, with a response rate of 18.9% (35/185). A student t-

test was used to calculate the differences in management for ACL injuries in athletes and non-athletes; $P < 0.05$ was considered to be significant (Figure 1). A one-way ANOVA was used to calculate the relationships between the questions 1, 2, 5; and 6, asking about the surgeons' bracing practices in athletes and non-athletes; $P < 0.05$ was again considered to be significant (Figure 2). A Tukey HSD post hoc test was used for the statistically significant differences found by the one-way ANOVA when homogeneity of variances could be assumed. A chi-square test was used for questions 3 and 4 to determine if surgeons relied on the medical/surgical evidence or their clinical experience for making decisions about bracing postoperatively; $P < 0.05$ was considered to be significant (Figure 2).

The primary outcome measure for the proposed study was to determine the opinions of NW Ohio and SE Michigan AAOS members regarding their management of ACL injuries in athletes versus non-athletes. The secondary outcome measure was to assess the knowledge and attitudes of the survey participants' use of knee braces in their patients postoperatively and for return to sport.

Results

The survey was sent to 197 orthopedic surgeons selected by using the search directory

feature on the AAOS website. The survey used is shown in Figure 1 and 2. Twelve of the

surveys were returned to the sender due to an incorrect address listed on the website. A total of

35 surgeons responded (18.9%). Of those that responded, 25.7% (9/35) had not treated or

referred at least one patient for ACL deficiency in the last year, so they did not complete the rest

of the questionnaire. A total of 68% of the responding surgeons considered the focus of their

practice to be sports medicine and/or knee injuries. Additionally, 72% (25/35) were also the

primary care physician or a member of a practice responsible for the coverage of a high school,

intercollegiate, semi-professional, or professional sports team.

The average number of ACL deficient athletes and non-athletes treated by each of the

surgeons in the previous month was 7.6 (range, 0-75, SD =14.6) and 4.7 (range, 0-25, SD = 4.2)

respectively. Additionally, the average number of ACL reconstructions performed by the

surgeons in the past year was 27.4 (range, 0-200, SD = 41.6) in athletes and 21.8 (range, 0-110,

SD = 27.4) in non-athletes. No statistically significant differences were found between athletes

and non-athletes regarding graft type, rehabilitation protocol, or bracing practices.

The survey included questions about the optimal time to perform reconstruction and

preferred graft type in both athletes and non-athletes. A large majority of surgeons who had

performed reconstruction, or 81.8% (18/22), considered "after full range of motion was

obtained" as the optimal time for surgery following an acute ACL injury. The remainder of the

surgeons stated they wait an average of 2.7 weeks (range, 2-4, SD = 1.0) after the injury. The

responses for athletes and non-athletes were the same for both of these questions. The surgeons

were also asked which tissue type they preferred for the ACL reconstruction (Figure 3). For

athletes, 42.86 (9/21) preferred using a patellar autograft and for a non-athlete, 28.57% (6/21) preferred using an allograft.

The next questions probed rehabilitation protocols used in athletes and non-athletes following ACL reconstruction. The surgeons were asked when they allowed full weight bearing and range of motion after an ACL reconstruction regardless of associated procedures. The average time before allowing full weight bearing was 0.4 (range, 0-6, SD = 1.5) weeks in both athletes and non-athletes and the average time before allowing full range of motion was 0.5 weeks (range, 0-3, SD = 0.9) in both athletes in non-athletes. The average time to initiate physical therapy was 1.3 weeks (range, 0-4, SD = 0.794) in both athletes and non-athletes. The surgeons required an average of 15.4 (range, 8-52, SD = 10.1) weeks of physical therapy in athletes and 12.9 (range, 6-25, SD = 5.0) weeks of physical therapy in non-athletes.

Additionally, the surgeons were asked about actual usage of bracing for rehabilitation and return to sport and expected time frame for resumption of sporting activity following surgery. Table 1 shows the percentage of athletes and non-athletes and the number of weeks the surgeons brace in the general postoperative period, while Table 2 shows the same information for bracing for return to sport. The surgeons expected athletes to return to all (competitive) sports in an average of 27.5 (range, 16-52, SD = 8) weeks. For a non-athlete, they expected them to return to all (recreational) sports in an average of 29.1 (range, 16-52, SD = 10.0) weeks.

The final questions asked about the surgeons' attitudes/opinions and knowledge of the medical/surgical literature and evidence regarding usage of rehabilitative and functional knee braces (Figure 4, Table 3). For the first question, the one-way ANOVA showed there were statistically significant differences between the surgeons' attitudes of the medical/surgical evidence regarding the use of postoperative braces for at least 6 weeks and the length of time

they prescribed braces postoperatively in *athletes* (F 2, 19 = 5.503, p = 0.013). These results are shown in Table 4. The post hoc Tukey HSD revealed statistically significant differences between those who either *strongly disagreed or diagreed* with the statement and those who *agreed* when data were adjusted for difference in group size. Those who *strongly disagreed* with the statement prescribed postoperative braces for an average of 1.67 weeks. Similarly, those who *disagreed* with the statement prescribed postoperative braces for an average of 2.58 weeks, while those who *agreed* prescribed postoperative braces for 10.71 weeks (Table 5). In summary, those who agreed with the published medical/surgical evidence concerning use of a postoperative brace for at least the first 6 weeks prescribed postoperative braces for a longer period of time in athletes.

The one-way ANOVA also revealed statistically significant differences between the surgeons' group attitude/opinion of the medical/surgical evidence regarding the use of postoperative braces for at least 6 weeks and the length of time they prescribed braces postoperatively in *non-athletes* (F 2, 19 = 5.739, p = 0.011). These results are shown in Table 6. The post hoc Tukey HSD discovered statistically significant differences between those who *strongly disagreed* with the statement and those who *agreed* when data were adjusted for difference in group size. Those who *strongly disagreed* with the statement prescribed postoperative braces for an average of 1.67 weeks, while those who *agreed* prescribed them for 10.86 weeks (Table 7). Therefore, those who believed the medical/surgical evidence supported the use of a postoperative brace prescribed postoperative braces for a longer period of time not only in non-athletes, but also in athletes. So within the group of surgeons surveyed, there is a wide variance of opinion and interpretation for whether the existing medical/surgical evidence supports or doesn't support the use of the brace, together with a wide variance in the actual practice for prescribing.

Statistically significant differences were also exposed by the one-way ANOVA between the surgeons' attitudes of the medical/surgical evidence supporting the use of a brace for participation in sports regarding the length of time they prescribed a *non-athlete* a brace for participation in sports (F 2, 20 = 5.603 p = 0.012). These results are shown in Table 8. There were no statistically significant differences in *athletes*. The post hoc Tukey HSD test found statistically significant differences between those who *strongly disagreed* and those who either *disagreed or agreed* when data were adjusted for difference in group size. Those who strongly *disagreed* with the statement prescribed *non-athletes* braces for an average of 0 weeks for participation in sports, and those who *disagreed and agreed* prescribed braces for an average of 33.29 and 47.33 weeks respectively (Table 9). Consequently, those who believed the medical/surgical evidence supported the use of a brace for sport prescribed non-athletes, but not athletes, a brace for return to sport for a longer time period of time. Finally, and notably, the one-way ANOVA did not find any statistically significant differences for questions 5 and 6 asking about changes or evolutions in brace prescription patterns over the last five years.

A chi-square test was used to determine whether the majority of the survey respondents relied on the medical/surgical evidence for making decisions about braces, or whether they used their own clinical experience. For question number 3, asking if the surgeons rely on their clinical experience, 10 surgeons responded either *strongly disagree or disagree*, while 13 responded either *strongly agree or agree* (Table 10). The expected response was 11.5 for each. No statistically significant differences were found (p = 0.532.). These results are shown in Table 11. For question number 4, asking if they surgeons rely on the medical/surgical evidence, 17 surgeons responded either *strongly disagree or disagree*, while 7 responded either *strongly agree or agree* (Table 12). The expected response was 12 for each. Statistically significant differences

were found as more surgeons responded *strongly disagree or disagree* for this question (p = 0.041). These results are shown in Table 13. The responding surgeons overall clearly do not rely solely on the medical/surgical evidence for making decisions about braces postoperatively, yet they also do not rely significantly on their own clinical experience, as the results for this question were inconclusive.

Discussion

A survey of the NW Ohio and SE Michigan AAOS members showed they do not manage ACL injuries much differently in athletes versus non-athletes. However, within the group their knowledge and attitudes regarding the medical/surgical evidence and their clinical experience did influence their prescription of knee braces both for the postoperative period and for return to sport. Moreover, the surgeons claimed to not rely on the medical/medical surgical evidence for making decisions about braces postoperatively (question 4), while the results for whether or not the surgeons use their own clinical experience were inconclusive (question 3).

The survey results showed no statistical differences between treating athletes and non-athletes regarding graft type. A study conducted by Delay et al. (2001) had also surveyed AAOS members and found similar results. Those surveyed did not consider being a male/female athlete to be an important factor for use of a hamstring graft (Delay, et al.). Conversely, a prospective study conducted by Gobbi, Tuy et al. (2003) suggested hamstring grafts may be the best choice for a particular subset of athletes. Their study concluded the quadrupled bone-semitendinosus graft is safe to use for ACL reconstruction and recommended that hamstring tendon autografts should be used in athletes who wished to return to sports associated with a higher incidence of patellar tendinitis (Gobbi, Tuy, et al.). However, although hamstring tendon autografts may be a better choice for certain narrow subsets of athletes, the survey of NW Ohio and SE Michigan AAOS members concluded they are not used more significantly in athletes than non-athletes.

This survey also found no significant differences between athletes and non-athletes regarding rehabilitation protocols. Several other studies have shown that athletes who are not confident in their reconstructed knee and that have difficulty resuming running and agility activities, may as a result not return to their sport following ACL reconstruction (Gobbi &

Francisco, 2006; Kvist, et al., 2005; Lee, et al., 2008). Therefore an athlete's rehabilitation protocol may need to be more intense and rigorous than a non-athlete to prepare him for return to a higher level of competition than the average person. However other literature tends to support the finding of this survey that both athletes and non-athletes may benefit from participating in accelerated rehabilitation protocols following ACL reconstruction (Aune, et al., 2001; Muellner, et al., 1998; Shelbourne, et al., 1995; Shelbourne & Nitz, 1990).

The surveyed AAOS members use rehabilitation braces in approximately 78% of all athletes and non-athletes for an average of 5 weeks with no significant differences in bracing practices between the two groups, despite studies conducted by Harilainen and Sandelin (2006) and Möller et al. (2001) concluding that wearing a brace for the first 6-12 weeks postoperatively following ACL reconstruction provided no benefit in terms of functional activity or knee stability. So despite mounting evidence that a rehabilitation brace is not necessary following ACL reconstruction, the results of this survey are similar to a study conducted by Delay et al. (2001) who also surveyed members of the AAOS and found nonetheless that 85% of members prescribe a rehabilitation brace for an average of 3.8 weeks in all patient cases.

AAOS members may continue to prescribe rehabilitation braces despite the contradicting literature for different reasons. First, they may rely more on their own clinical experiences than the medical literature for making rehabilitation brace decisions. While 67% of surgeons who responded to this survey agreed or strongly agreed that they rely on their clinical experience for making decisions about braces postoperatively, the chi square test did not find this significant. Second, even though the rehabilitation braces may not create a better functional outcome for the patient, surgeons may feel they provide the patient with a psychological advantage because the graft seems more protected with a brace.

Furthermore, the results of this survey also showed the surgeons who believe the medical/surgical evidence supported the use of rehabilitation braces following ACL reconstruction prescribed postoperative braces for a significantly longer period of time in both athletes and non-athletes. As a result, one may infer that surgeons who perform fewer ACL reconstructions each year, and/or whose practice extends beyond only orthopedics, are not aware of the more recent literature regarding rehabilitation bracing. Additionally, it is also possible that these surgeons have seen the literature that demonstrates no benefit for rehabilitation bracing following ACL reconstruction, but they are not convinced of the results because of the study's design. In any event, there is a lot of inconsistency between surgeons in the actual practice for the overall general patient population.

For bracing in sports, there were no statistically significant differences between (high level) athletes and more recreational sporting, non-athletes. The surgeons responded that they brace 67% of athletes for 38 weeks and that they brace 38% of non-athletes for 33 weeks, despite literature stating that functional knee braces do not provide mechanical protection or impact proprioception or postural control during sporting activities (Birmingham, et al., 2001; Fleming, et al., 2000). Furthermore, several studies have shown wearing a functional knee brace does not impact the reconstructed ACL's stability and does not change a person's function or activity level (Birmingham, et al., 2008; McDevitt, et al., 2004; Risberg, Holm, et al., 1999). Finally, functional knee braces may decrease a person's performance level (Wu, et al., 2001).

Even though the evidence does not support the use of a functional knee brace for return to sport following ACL reconstruction, the results from this survey were comparable to a study conducted by Delay et al. (2001) that nonetheless found 71% of surgeons prescribe a brace for up to 1 year and that 25% prescribe a brace for 1-2 years. Surgeons may continue to prescribe

functional knee braces for return to sport in both athletes and non-athletes despite the evidence

for different reasons. First, functional knee braces have been shown, in certain cases, to increase

a person's confidence in the reconstructed knee for return to sport (Birmingham, et al., 2008). As

a result, if surgeons allow the patients to decide whether or not they want to wear a brace for

return to sport, the patients themselves may choose to wear a brace. Also, the surgeons may be

broadcasting the results of this study over a broader population. Second, the surgeons may rely

more on their clinical experience than the medical/surgical evidence. This survey did not find

evidence that significantly more surgeons rely on their clinical experience for prescription of

braces postoperatively, although the small sample size may have affected the results.

The results of this survey also found that some surgeons who believed that the

medical/surgical evidence supported the use of a brace for sport, prescribed recreational non-

athletes, but not athletes, a brace for return to sport for a longer period of time. Similarly, Yu et

al. (2004) found a specially designed knee brace may be used in recreational athletes to prevent

re-injury; a non-athlete may be less concerned about a decrease in performance level due to the

brace as described by Wu et al. (2001) and more concerned about prevention of future injury. As

a result, the results of this survey support the idea that a functional knee brace may be prescribed

in non-athletes for up to 1 year following ACL reconstruction because of the psychological

benefits in addition to the possible added benefit of injury prevention. On the contrary, a

functional knee brace should not be prescribed in athletes returning to sports who have

demonstrated recovered knee stability and muscle strength.

A chi square test found that the surgeons overall as a group tend not to rely on the

medical/surgical evidence for making decisions about braces postoperatively. It was also

inconclusive about whether the surgeons rely on their clinical experience. The results showed no

significant differences between the number of surgeons that agreed versus those that disagreed. A survey of the AAOS by Marx et al. (2003) found the brace prescription patterns were related to the number of surgeries performed; those who performed more surgeries prescribed fewer braces, and vice versa. This suggests the surgeons rely more on their clinical experience, which disagrees somewhat with the findings in this survey. It is possible that the results of this survey are inconclusive because of the small sample size. Further studies would be beneficial to better determine the surgeons' motivation for brace prescription following ACL reconstruction.

This study has inherent limitations. First, the survey was only mailed to NW Ohio and SE Michigan AAOS members and thus, the results may not be as applicable to all AAOS members or all areas of the country. Second, the small sample size and low response rate may have skewed some of the results. Finally, it is difficult for surgeons to provide patient estimates for the survey questions and it is also difficult for them to fully convey attitudes and opinions in a survey format.

This study also has several implications for physician assistants. For a physician assistant or ("PA") working in an orthopedic practice, he must understand and be familiar with his supervising physician's postoperative management of ACL rehabilitation in both athletes and non-athletes. It is also important that he be aware of both the existing literature, and of his supervising physician's view of this literature regarding bracing for rehabilitation and sport, because it may influence his decision making regarding bracing following ACL reconstruction. Finally, the PA should ask his supervising physician whether or not he uses the medical/surgical evidence or his clinical experience to make decisions about bracing postoperative. This will allow the PA to be better informed about the motivation behind his supervising physician's

protocol for ACL rehabilitation postoperatively, and thus enable him to correctly inform his

patients about the reasons behind each step in the rehabilitation process.

Conclusion

The SE Michigan and NW Ohio AAOS surgeons who were surveyed generally do not use different graft types, or rehabilitation and bracing protocols in athletes and non-athletes. Likewise, they prescribe the same waiting period after surgery before allowing weight-bearing activities, and before starting physical therapy for both groups. The only difference noted in the post-operative protocol is that the surgeons prescribe a slightly longer physical therapy program for athletes than for non-athletes. Most surgeons reported that they did not follow the reported medical/surgical evidence in their practices. However, those who agreed that the medical/surgical evidence supported the use of postoperative braces for at least 6 weeks prescribed postoperative knee braces for a longer period of time in athletes and non-athletes. So overall, the group of surveyed orthopedic surgeons reported little difference in their treatment of athletes and non-athletes; this is not inconsistent with the medical/surgical evidence.

Although the medical/surgical evidence reports that patellar tendon grafts are the most often used nationally, the evidence further reports no significant differences in patient outcome between patellar and hamstring tendon grafts, so the surveyed protocol is consistent with this evidence. The medical/surgical evidence also supports a quick postoperative return to weight bearing activity, and likewise the local surgeons conform to this practice in both athletes and non-athletes. The medical/surgical evidence does not report broad, quantifiable benefits from postoperative bracing, and the local surveyed group reported little or no difference for prescribing bracing between athletes and non-athletes.

In general the existing medical/surgical evidence is sometimes inconsistent, and clearly still in development. Therefore it would be difficult for an orthopedic surgeon to establish his protocol based solely on following this evidence. Likewise, the SE Michigan and NW Ohio

AAOS surgeons who were surveyed answered that they were more likely to follow their own clinical experience than the medical/surgical evidence. However in actual practice, their treatment of athletes and non-athletes aligns with the evidence fairly well.

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Bracing in postoperative period		Mean	Range	SD
Athletes	**% Braced**	78.26%	0-100	42.174
	Length of Time (weeks)	5.05	0-24	6.565
Non-Athletes	**% Braced**	78.26%	0-100	42.174
	Length of Time (weeks)	5.14	0-24	6.541

Table 1. The length of time and percentage of athletes and non-athletes braced in the postoperative period by the NW Ohio and SE Michigan AAOS members.

Bracing for return to sport				
		Mean	**Range**	**SD**
Athletes	**% Braced**	67.17%	0-100	24.628
	Length of Time (weeks)	38.43	0-78	24.628
Non-Athletes	**% Braced**	38.43%	0-100	23.859
	Length of Time (weeks)	32.61	0-52	23.859

Table 2. The length of time and percentage of athletes and non-athletes braced for return to sport by the NW Ohio and SE Michigan AAOS members.

Survey questions for orthopedic surgeons attitudes and beliefs regarding ACL reconstruction	
Q1	The medical surgical evidence supports the use of a brace for at least 6 weeks postoperatively
Q2	The medical surgical evidence supports the use of a brace for participation in sports.
Q3	I rely on my clinical experience for making decisions about the prescription of braces postoperatively.
Q4	I rely on the medical/surgical evidence for making decisions about the prescription of braces postoperatively.
Q5	I prescribe fewer braces for at least 6 weeks postoperatively than I did 5 years ago.
Q6	I prescribe fewer braces for participation in sports than I did 5 years ago.

Table 3. The reference table for labels Q1-Q6 with the corresponding survey question.

ANOVA for question 1: Athletes

Length (weeks) of postoperative bracing in athletes

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	331.943	2	165.971	5.503	0.013*
Within Groups	573.012	19	30.159	-	-
Total	904.955	21	-	-	-

*p < .05

Table 4. One-way ANOVA results for question 1 and the length of postoperative bracing in athletes.

Tukey HSD post hoc test for question 1: Athletes

Length (weeks) of postoperative bracing in athletes

Q1	N	Subset for alpha = 0.05	
		1	**2**
strongly disagree	3	1.67*	
disagree	12	2.58	2.58
agree	7		10.71*
Sig.		.960	.063

*p < 0.05

Table 5. Tukey HSD post hoc test finds statistically significant differences between strongly disagrees and agrees.

ANOVA for question 1: Non-athletes

Length (weeks) of postoperative bracing in non-athletes

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	338.400	2	169.200	5.739	0.011*
Within Groups	560.190	19	29.484	-	-
Total	898.591	21	-	-	-

*p < 0.05

Table 6. One-way ANOVA results for question 1 and postoperative length of bracing in non-athletes.

Tukey HSD post hoc test: Non-athletes

Length of Postoperative Bracing in Non-athletes

		Subset for alpha = 0.05	
Q1	N	1	2
strongly disagree	3	1.67*	
disagree	12	2.67	2.67
agree	7		10.86*
Sig.		.951	.058

*p < 0.05

Table 7. The Tukey HSD post hoc test found statistically significant differences between strongly disagrees and agree.

ANOVA for question 2

Length (weeks) of bracing for sports in non-athletes

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4497.288	2	2248.644	5.603	0.012*
Within Groups	8026.190	20	401.310	-	-
Total	12523.478	22	-	-	-

*p < 0.05

Table 8. One-way ANOVA results for question 2 and the length of time braced for sports in non-athletes.

Tukey HSD post hoc test for question 2

Length (weeks) of bracing for sport in non-athletes

Q2	N	Subset for alpha = 0.05	
		1	2
strongly disagree	3	0*†	
disagree	14		33.29*
agree	6		47.33†
Sig.		1.000	.504

* p <0.05, † < 0.05

Table 9. The Tukey HSD post hoc test found statistically significant differences between strongly disagree and disagree and also between strongly disagree and agree.

Chi-square test for question 3

	Observed N	Expected N	Residual
Disagree or strongly disagree	10	11.5	-1.5
Agree or strongly agree	13	11.5	1.5
Total	23		

Table 10. The chi-square test for question 3 shows the expected number of responses for each category versus the observed number of responses for each category.

Chi-square test statistics for question 3

	Q3
Chi-Square	.391[a]
df	1
Asymp. Sig.	.532

Table 11. No statistically significant differences were observed between the responses for question 3.

Chi-square test for question 4

	Observed N	Expected N	Residual
Disagree or strongly disagree	17	12.0	5.0
Agree or strongly agree	7	12.0	-5.0
Total	24		

Table 12. The chi-square test for question 4 shows the expected number of responses for each category versus the observed number of responses for each category.

Chi-square test statistics for question 4

	Q4R
Chi-Square	4.167[a]
df	1
Asymp. Sig.	.041

*Table 13. S*tatistically significant differences were observed between the responses for question 4.

Sample survey pages one and two: Orthopedic survey on ACL deficiency management in athletes vs. non-athletes

Figure 1. Page one and two of the sample survey mailed to the NW Ohio and SE Michigan AAOS members.

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Sample survey page three: Orthopedic survey on ACL deficiency management in athletes vs. non-athletes

ALL QUESTIONS PERTAIN TO THE POSTOPERATIVE PERIOD FOLLOWING A PRIMARY ACL SURGERY WITH NO ASSOCIATED PROCEDURES. PLEASE SELECT THE BEST ANSWER.				
The medical/surgical evidence supports the use of a brace for at least 6 weeks postoperatively.	Strongly Disagree	Disagree	Agree	Strongly Agree
The medical/surgical evidence supports the use of a brace for participation in sports.	Strongly Disagree	Disagree	Agree	Strongly Agree
I rely solely on my clinical experience for making decisions about the prescription of braces postoperatively.	Strongly Disagree	Disagree	Agree	Strongly Agree
I rely solely on the medical/surgical evidence for making decisions about the prescription of braces postoperatively.	Strongly Disagree	Disagree	Agree	Strongly Agree
I prescribe fewer braces for at least 6 weeks postoperatively than I did 5 years ago.	Strongly Disagree	Disagree	Agree	Strongly Agree
I prescribe fewer braces for participation in sports than I did 5 years ago.	Strongly Disagree	Disagree	Agree	Strongly Agree

Thank you for your time and participation in this survey.

Figure 2. Page three of the sample survey mailed to the NW Ohio and SE Michigan AAOS members.
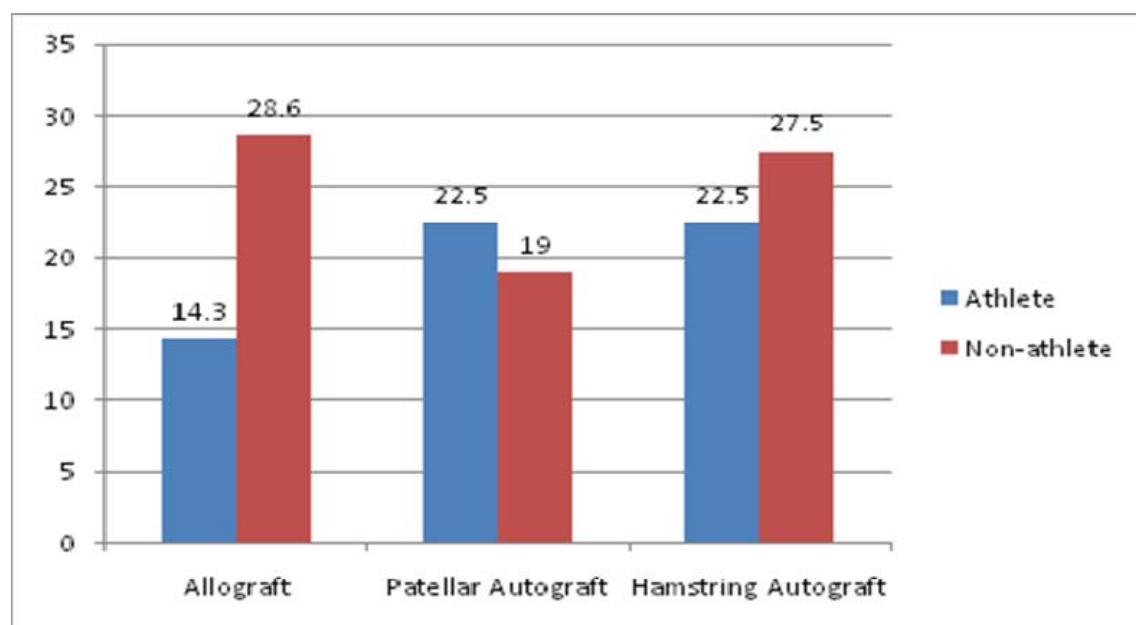
Peferred tissue type for ACL reconstruction

Figure 3. The percentage allografts, patellar autografts, and hamstring grafts used is athletes and non-athletes by the NW Ohio and SE Michigan AAOS members.

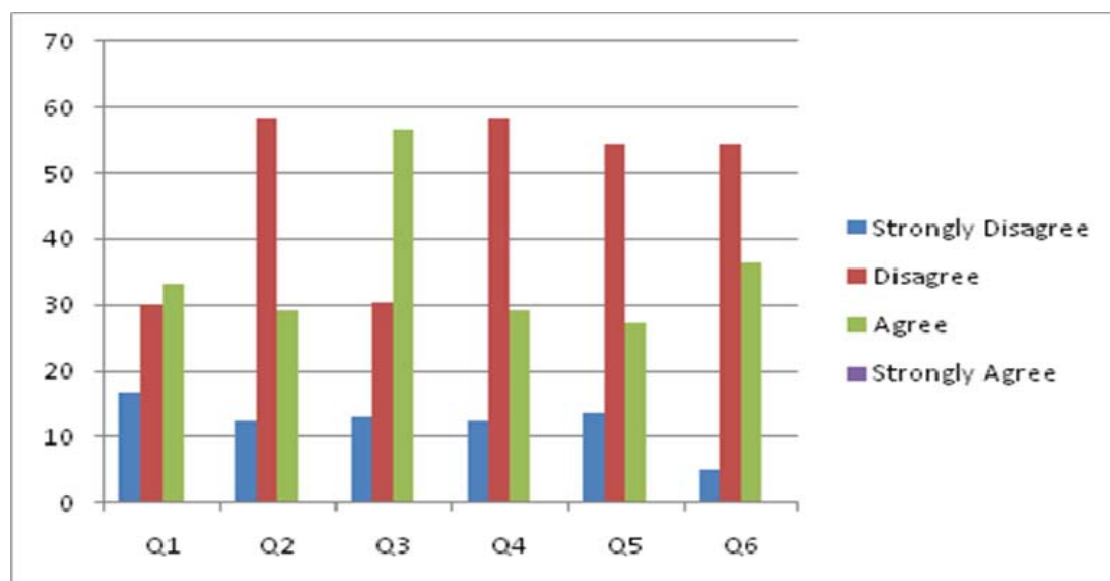Knowledge and attitudes of orthopedic surgeons regarding bracing for rehabilitation and return to sport

Figure 4. Percentage of NW Ohio and SE Michigan AAOS members that strongly disagreed, disagreed, agreed, and strongly agreed with the survey questions listed in table 3.

Abstract

Objective: Northwest Ohio and Southeastern Michigan members of the AAOS were surveyed to determine their practice regarding management of ACL injuries athletes versus non-athletes and their knowledge and attitudes of regarding the use of knee braces. *Method:* Surveys were mailed to 197 AAOS members who were within 50 miles of the "43614" zip code. *Results:* A student t-test revealed no significant differences between the management of ACL injuries in athletes versus non athletes (p<0.05). The chi-square test found 10/23 members did not rely on the evidence for brace prescription, which was significant (p<0.05). *Conclusion:* The AAOS members surveyed did not manage ACL injuries differently in athletes or non-athletes, which is consistent with the literature. The literature is inconsistent regarding the use of knee braces postoperatively; the surgeons did not rely on the literature for brace decision making, but results were also inconclusive about their reliance on clinical experience.