SUMMARY

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The anterior cruciate ligament (ACL) plays a vital role in the foundation of the knee joint kinematics since the very early beginning of the joint. It performs, in concert with other structures of the central pivot, the function of a true gear mechanism that is responsible for the integrated three-dimensional movements of the knee (Muller, 1983). Furthermore, it represents the primary passive restraint to excessive anterior tibial translation on the femur (Butler et al., 1980), and to anterolateral subluxation of the lateral tibial plateau between 20 and 40 degrees of flexion (Matsumoto, 1990). The ACL provides also an important prprioceptive role that may influence the functional stability of the joint via reflex preprogramming of the periarticular muscular contractility (Johansson et al., 1991).

Unfortunately, injuries to this vital ligament is relatively common as they represent about 1/3 of sports injuries to the knee joint (Ross et al., 1995). The ACL may be injured also during road traffic and other accidents (Warren, 1984). Although ACL injuries are commonly associated with other major ligamentocapsular structures, they may occur solely (MacDaniel & Dameron, 1980). However, these isolated injuries are commonly associated with meniscal tears (Warren, 1990).

ACL injury initiates a syndrome of functional disabilities of variable severity, and may set the basis of progressive damage to the knee joint (Noyes et al., 1985). Therefore, proper treatment of such injury is mandatory. The most successful treatment protocol is markedly debated. However, it is widely accepted that augmented surgical repair of acute injuries and reconstruction of chronic ones represent the treatment of choice for patients who are willing to regain an active life-style (Ciccotti et al., 1994). Several autografts, allografts, xenografts, and synthetic ligaments can be used for intraarticular reconstruction of chronic ACL injuries. Nevertheless, autografts are placed at the forefront of all these substitutes because of their biological and biomechanical similarity to the ACL, with less serious postoperative complications (Johnson et al., 1992). Of all autogenic substitutes, the bone-patellar tendon-bone graft is the most widely preferable because of its ultimately high mechanical strength, and reliable fixation. However, this graft may be responsible for some serious complications including: patellar fractures, patella baja or alta, patellar tendon rupture or tendinitis (Engebretsen et al., 1990; Kleipool et al., 1994; Shelbourne & Patel, 1995). A

relatively high incidence of anterior knee pain was recorded following harvesting the patellar tendon (Kleipool et al., 1994). This pain was found to be correlated with the considerable shortening of patellar tendon that was frequently reported following utilization of this tendon (O'Brien et al., 1991; Dandy & Desai, 1994). In terms of avoidance of these serious complications, using one or two of the pesanserinus tendons for intraarticular substitution of chronically damaged anterior cruciate ligaments appears to be an attractive treatment option. This method however is theoretically criticized because of the relatively inadequate initial tensile strength of these tendons (Moyer & Marchetto, 1992). In spite of this theoretical disadvantage, several authors reported encouraging results following utilization of the pesanserinus tendons (Lipscomb, 1981; Gomes & Marczyk, 1984; Zariczny j, 1987; Puddu et al., 1988; Ferrtti et al., 1989; Wilson & Scranton, 1990) Additionally, Harter et al. in 1989, and Marder et al. in 1991 reported that the final results following the use of the semitendinosus tendon are comparable to those of the patellar tendon. These arguments created a challenge that stimulated us to investigate this attractive subject. Accordingly the present study has been already performed in an attempt to evaluate the clinical results following intraarticular substitution of chronically damaged anterior cruciate ligaments using the distally based semitendinosus tendon.

Between June (1992) and January (1996), 50 military male patients were subjected to this study. These patients had an average age of 23.4 years, and an average weight of 64.5 Kg. Of these 50 cases 28 left and 22 right knees were involved. They all had chronic ACL injuries with an average duration of 14.14 months. Although non of these cases had had concomitant medial collateral or posterior cruciate ligaments injuries, 58% of them had different pattern of associated medial and lateral meniscal tears. Surgical reconstruction was justified for all patients because they were willing to have the active life-style required for their occupations. Intraarticular substitution of the damaged ACL using a distally based semitendinosus tendon was the technique of choice. The semitenidnosus tendon was solely transplanted (the technique of Cho, 1975) in the initial 10 cases, while simultaneous use of both the semitendinosus and gracilis tendons in a distally based fashion (the technique of Lipscomb et al., 1981) was routinely applied for the rest of cases. All surgical procedures were performed in the Helmeia Orthopedic Military hospital between June, 1992 and August, 1993.

All patients have been followed-up for an average period of 28.74 months. A 100-point scale was applied for independent subjective and objective quantitative evaluation of each patient pre and postoperatively. According to this scale we have achieved 23 excellent, 21 good, 4 fair, and 2 poor subjective results. Objectively, we have achieved 11 excellent, 31 good, 2 fair, and 6 poor results. From the functional point of view, 44 patients (88%) have already returned to their occupations without limitations. Twenty-six of these 44 cases (52% of the total number of patients) have restored their pre-injury athletic fitness; while the remaining 18 patients have got some limitations in sports. Six out of the total 50 patients (12%) have lost their military career. Parametric statistical analysis has revealed significant subjective and objective improvements. The t-Critical-one tail has been found to be significant at 0.01 for both subjective and objective results. Subjective and objective advancement by 2 grades was the most common pattern of improvement as detected by the mode. Total meniscectomies (either medial or lateral), and lack of augmentation have been found to adversely affect the results.

The gained advantages of the procedure included: relative simplicity of the technique, preservation of the anatomical and functional integrity of the extensor apparatus and of other periarticular supporting structures, and regain of adequate hamstrings strength. Retaining of the physiological tibial attachment facilitated adequate tensioning of the graft, and could preserve its viability particularly if the paratenon is preserved.

The main disadvantage of the procedure is inadequate fixation of the graft to the lateral femoral condyle, compared with bone to bone fixation. This relatively unreliable fixation mandates absolute postoperative immobilization until physiological incorporation of the graft has been already established, otherwise the graft's competence will be significantly reduced. Screw and washer fixation as well as the additional use of a cylindrical bone plug that was routinely jammed into the relatively small femoral transosseous tunnel would ensure adequate fixation and early incorporation of the graft with consequent reduction of the immobilization period. However this method of fixation cannot be applied for the not uncommonly found short tendons as they cannot traverse the femoral tunnels.

Complications of the procedure were trivial. They were mostly related to the fixation devices as 15 patients (30%) developed painful granulomatous reaction in relation to these devices. Other complications included slough of skin edges in 7 cases (14%), superficial wound infection in 2 cases (4%), significant permanent stiffness in 2 cases (4%), and injury of the saphenous nerve in one case (2%). Except for permanent stiffness, all these complications have been successfully treated with no residuals. Fortunately they did not affect the results that have been found to be comparable to the commonly published successful ones.

We have finally concluded that intraarticular substitution of a chronic ACL-insufficient knee using a proximally based augmented semitendinosus tendon is often successful. We recommend using of the adjacent gracilis tendon for augmentation of the relatively weak semitendinosus tendon (the technique of Lipscomb et al.).