Abstract
Postoperative donor-site morbidity and anterior knee pain following ACL surgery may result in substantial impairment for the patient. The selection of graft, surgical technique and rehabilitation program can affect the occurrence of undesirable pain conditions.

The loss or disturbance of anterior sensitivity caused by intraoperative injury to the infrapatellar nerve(s) in conjunction with patellar tendon harvest is correlated with donor-site discomfort and an inability to kneel and knee walk.

The patellar tendon at the donor site displays significant clinical, radiographic, histological, and ultrastructural abnormalities several years after harvesting its central third. The donor-site discomfort correlates poorly with radiographic and histological findings after the use of patellar tendon autografts. The use of hamstring tendon autografts causes less postoperative donor-site morbidity and anterior knee problems than the use of patellar tendon autografts. There also appears to be a regrowth of the hamstring tendons within two years after the harvesting procedure. There is a lack of knowledge in terms of the course of the donor site after harvesting fascia lata autografts. Harvesting quadriceps tendon autografts appears to cause low donor-site morbidity.

Efforts should be made to spare the infrapatellar nerve(s) during ACL reconstruction using patellar tendon autografts as well as hamstring autografts. Reharvesting the patellar tendon cannot be recommended due to significant clinical, radiographic, histological, and ultrastructural abnormalities several years after harvesting its central third. It is important to regain full range of motion and strength after the use of any type of autograft to avoid future anterior knee pain problems.

Since randomized controlled trials have shown that the laxity measurements and clinical results following ACL reconstruction using hamstring tendon autografts are similar to those of patellar tendon autografts, we recommend the use of hamstring tendon autografts due to fewer donor-site problems.

Introduction
At the present time, arthroscopic ACL reconstruction is one of the most common surgical procedures in sports medicine. Every year, approximately 150,000 procedures are performed in the United States. After the introduction of the arthroscopic technique and the opportunity to perform reproducible anatomic replacements of the ruptured ACL, the results in terms of restored laxity and a return to sports activities have generally been found to be good. However, persistent donor-site morbidity such as tenderness, anterior knee pain, disturbance in anterior knee sensitivity, and the inability to kneel and knee walk is still a problem and is present in approximately 40–60%, at least in patients who have undergone arthroscopic ACL reconstruction using patellar tendon autografts. Despite efforts to utilize synthetic materials and allografts, the use of autografts probably remains the best option for the replacement of the torn ACL. Common autograft alternatives for reconstruction or augmentation...
of the ACL include the use of the iliotibial band,16-20 the hamstring tendons,21-26 the patellar tendon,1,27-32 and the quadriceps tendon.33-36

Provided that the surgical technique was correctly used and no internal derangement of the knee has occurred, late problems related to the donor site after ACL reconstruction using autografts can be divided into three categories.

1. General pain and discomfort in the anterior knee region caused by a decrease in function such as range of motion (ROM) and muscular strength
2. Specific discomfort in terms of numbness, tenderness, and the inability to kneel or withstand pressure toward the donor-site area
3. Late tissue reactions in, or close to, the donor site

There are several ways of assessing the donor site and anterior knee region problems.

1. Clinically useful tools are measurements of strength using either functional tests such as the one-leg-hop test or dynamometers (e.g., Cybex®, Hoover Inc., Austin, Texas, USA), measurement of loss of motion, assessment of the kneeling or knee-walking ability, and measurement of the disturbance or loss of sensitivity in the donor-site area or in the area that is innervated by nerves passing the donor-site region.
2. Radiographic assessments using standard radiographs, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasonography.
3. Histological, biochemical, and ultrastructural assessments of samples obtained from the donor-site area.

The amount of information about the donor site after the use of patellar tendon autografts is fairly extensive. Recently the amount of information about donor-site problems following the use of hamstring autografts has increased. Some information describing the problems that can occur after ACL reconstruction using quadriceps tendon autografts is available. However, there is very little information after using fascia lata autografts.

**Postoperative Restriction in Range of Motion and Loss of Strength**

There appears to be agreement in the literature that the restoration of full extension compared with the noninjured side after ACL reconstruction is essential in order to avoid postoperative discomfort in the anterior knee region. Irrgang and Harner,37 Harner et al.,38 Sachs et al.,10 and Kartus et al.39 have all stated that the loss of extension contributes to anterior knee pain. Shelbourne and Trumper41 have stated that the restoration of full hyperextension is of major importance when it comes to avoiding anterior knee pain.

The influence of loss of flexion on anterior knee pain is controversial. Stapleton40 and Kartus et al.39 have stated that the loss of flexion causes significantly more anterior knee pain than the loss of extension and Aglietti et al.41 reported that a loss of flexion exceeding 10° might be correlated with anterior knee pain. However, Irrgang and Harner37 found that a loss of flexion rarely matters, unless the knee flexion is less than 110°.

Although these reports are all concerned with the use of patellar tendon autografts or allografts,37 we can generalize and state that the return of full range of motion (ROM) including full hyperextension is essential to reduce anterior knee problems after ACL reconstruction using any type of graft.

In line with this information, we recommend that it is essential to regain normal strength in the lower extremity to avoid future pain in the anterior knee region. Risberg et al.42 have reported that pain and strength are the most important variables, which affect the results after ACL reconstruction using patellar tendon autografts. Several reports on strength deficits after ACL reconstruction using autografts are found in the literature. Muneta et al.43 reported that the patients’ subjective evaluation of the results after ACL reconstruction using either hamstring or patellar tendon autografts was worse if the quadriceps or hamstring strength was decreased compared with the contralateral side. Hiemstra et al.44 reported that at one year the patients had substantial strength deficits in extension both after reconstruction using patellar tendon and hamstring tendon grafts. Feller et al.45 reported a quadriceps peak torque strength deficit up to one year after surgery after harvesting the patellar tendon compared with harvesting the hamstring tendons. Adachi et al.46 reported that the harvest of both semitendinosus and gracilis tendons causes more loss of active flexion angle and peak torque than the harvest of semitendinosus alone. Correspondingly Tashiro et al.47 recommended sparing the gracilis due to less loss of hamstring muscle strength at high knee