

**Le basi scientifiche del recupero: la guarigione del trapianto*****Healing of the ACL-Graft***

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When trying to decide when accelerated rehabilitation after ACL-reconstruction can start, the condition of the graft and its healing are of utmost importance. Especially the anchoring of the grafts in the bone tunnels. Most of the evidence that we rely on today is empirical like Shelbourne's studies from the U.S. To some extent we rely on animal experiments. Since the healing of ligaments varies between different animals, it is difficult to draw any definitive conclusions from these studies.

There are, however, some human studies, that have looked into the healing of the graft. One of the first studies was published in 1938 by the father of Swedish knee surgery, Ivar Palmer. He reported a case of an iliotibial band reconstruction that died of a late pulmonary embolus two and a half months after surgery. On autopsy the intra articular part of the band was covered with a well vascularized synovial membrane. The part of the tendon in the femoral bone tunnel had partly healed in.

Karl O Eriksson from our group in his PhD-thesis had the opportunity to study two cases of hamstring grafts (four-folded semitendinosus) that ruptured, one at 2 months and one at 7 months. In the 7-month case he was able to extract the graft with a core of bone from the tunnels. He found a healing with Sharpey's fibres just as you see with the PT BTB. In the 2-month case the healing was poor.

Since PT BTB heals with direct bone-healing, one can presume that it has healed relatively well within 6 weeks and completely in 3 months. Mikkelsen et al from our group has reported that isokinetic open kinetic chain training of the quadriceps muscle group from 6 weeks after PT BTB ACL-reconstructions did not cause any deterioration of the results. She did a paired study with a group that only received closed kinetic chain quadriceps training. This supports the fact that one can start early (6 weeks at least) with open kinetic chain rehabilitation in the PT BTB cases.

It is likely that it takes longer time before the hamstring grafts heal in sufficiently. Pässler et al reported an interesting study at ISAKOS in Montreux. Pässler uses exclusively hamstring grafts and accelerated early rehabilitation according to Shelbourne. He noticed, however, that in the cases where he had also done a meniscus repair and delayed his accelerated rehabilitation due to the meniscus repair, there was significantly less tunnel widening in tibia, than in the group where they started accelerated rehabilitation right away. Today we can probably state that the PT BTB allows a relatively early open-chain rehabilitation, at least from 6 weeks. The hamstring grafts should probably be protected somewhat longer - 3 months? There is, however, a need for well designed prospective randomised studies on this subject. I know that Suzanne Werner (my wife) has an ongoing double randomised study where she compares semitendinosus with PT BTB and in each group she also compares very early and late open chain kinetic rehabilitation. Once that study is ready, we will know a little more.

Interestingly, one is today trying to speed up the ingrowing of the grafts with different growth factors, so in the future, we might be able to start accelerated rehabilitation very soon postoperatively and we might also be able to return our athletes to the football field even earlier than today.

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