Introduction

Hamstring tendon grafts are increasingly used in ACL reconstruction. Fixation of the tendon graft within a bone tunnel can be achieved by different methods. Interference screws or suture discs are two of the most frequently applied devices. Some doubt exists about the primary stability that can be achieved. This experimental RSA study was performed to measure micromotion between tendon graft and bone under submaximal load after either interference screw or suture disc fixation. In addition, maximum load at failure and linear stiffness were measured and the failure mode was recorded.

Method

We used 20 porcine specimens for the study. The extensor hallucis longus tendon of the front leg was folded to a four-stranded graft and sutured with a base-ball stitch. The graft was anchored within a tibial tunnel of 8 mm diameter and 40 mm length either with a 7x25 mm biodegradable polylactid screw (Bioscrew, Linvatec) (n = 10) or 8 polyester sutures (Ethibond 5 USP) knotted over a titanium button (Suture Disc, Aesculap) (n = 10). The tibial bone, the tendon-graft and the interference screw were marked with tantalum beads. After fixation preloading with 100N was performed over 2 minutes. The grafts were then loaded axially under RSA control increasing the force in steps of 50N. Micromotion between tendon graft, screw and tibial bone were measured with RSA.

Results

Accuracy of RSA for the in vitro study was evaluated 0.03mm. Load at failure was significantly higher for screw fixation (536±76N) compared to suture disc fixation (445±37N). Linear stiffness of screw fixation was about 5 times higher compared to suture disc fixation (517±218N/mm versus 111±26N/mm, p<0.01). Slippage of the graft started at a load of 82N in the interference screw group and at 47N in the suture disc group. Slippage of the graft at 200N was 0.38mm (0.17–0.51) in screw group and 1.85mm (1.58–2.31) in the suture disc group. Elastic deformation (bungee cord effect) for the suture disc fixation was 0.67mm at 100N, 1.32mm at 200N and 2.52mm at 350N load.

Conclusions

After suture disc fixation of a quadrupled tendon graft the construct had a lower linear stiffness and the graft slipped out of the bone tunnel at lower loads. Low linear stiffness allows for a high amount of elastic deformation (bungee cord effect). Slippage occurred at loads that may occur during rehabilitation after ACL reconstruction. Interference screw fixation of tendon grafts is preferable to suture disc fixation.