INTRODUCTION

Postoperative mobilization after flexor tendon repair is an important and effective method of reducing adhesion formation, which commonly and severely impacts digit function. Successful rehabilitation depends on the strength of the tendon repair and the digit resistance. The ‘safe harbor’ in which therapy operates is bounded by the strength of the repaired tendon, which represents the maximum force which can be applied to the tendon during therapy, and the resistance to digit motion, which must be overcome during rehabilitation, and therefore represents the minimum effective force that must be applied. In clinical studies, postoperative rehabilitation starts usually from 1 to 3 days after tendon repair. The basis for the decision of a specific postoperative day to begin motion is in large part empirical, although Halikis et al1 showed, in an in vivo chicken model of tendon repair, that work of flexion was minimized by starting rehabilitation on postoperative day 3, compared to immediately, day 5 or day 7. Ideally, timing considerations should include factors such as work of flexion, repair strength and friction within the tendon sheath. Zhao et al have reported that the digit resistance including tendon gliding resistance was lowest at day 5 after tendon repair.2 What is the appropriate timing for starting the mobilization after FDP tendon repair? To answer this question, the following study using different timing to begin mobilization was proposed.

METHODS

Surgical Procedure: 24 dogs were divided into two groups; group 10A started postoperative therapy (passive flexion/extension digits with the wrist in 45 degrees flexion) at day 1 (a clinically popular starting date) and group 10B at day 5 (lowest digit resistance from our previous study). The 2nd, 3rd, and 5th flexor digitorum profundus (FDP) tendons were exposed through a mid-lateral incision in the paw between the proximal and distal annular pulleys. Two FDP tendons (from either 2nd or 5th and 3rd digits) were transected at . $F_1$ represents the force required to flex the digit with the area under this curve representing total work of flexion (TWOF). $F_2$ represents the force transferred to the distal bone to move the digit. The area between $F_1$ and $F_2$ is internal work expended due to resistance between tendon and sheath (IWOF). An end range of motion was chosen for all digits as 40° flexion.

Suture Strength: The repaired 3rd FDP tendon was dissected free, fixed in clamps in a servohydraulic testing machine (MTS, Minneapolis, MN) and tensile tested to failure at a rate of 20 mm/min. A differential variable reluctance transducer (MicroStrain, Burlington, VT) was attached to the tendon, spanning the laceration site. The maximum failure load and resistance to gap formation (calculated as the slope of the linear portion of the force versus gap formation curve) were determined.

RESULTS

Eight tendons from four dogs ruptured in group 10A (30%). There was no significant difference in TWOF or IWOF between groups 10A and 10B (p>0.05), however TWOF and IWOF in repaired tendons were significantly higher than both control and sham (p<0.05) (Figs. 2 and 3). There was no significant difference in maximum force or resistance to gap formation among the two groups (p>0.05) (Fig. 5).