INTRODUCTION
Braided polyester suture materials have been commonly used for flexor tendon repair in the clinical setting. However, knotted braided polyester lost approximately 50% of its tensile strength according to a study by Trail et al.(1) Accordingly, 4 or 5 throws are needed to prevent slippage for a secure knot, which may result in stitch granuloma. The use of absorbable sutures avoids problems associated with long-term foreign body implantation such as excessive fibrosis and stitch granuloma that could affect the critical smooth running of the tendons. However, many surgeons do not use absorbable sutures for flexor tendon repair, not only because they fear a loss in tensile strength but also because of an inflammatory response.

Several studies have analyzed polyglycolide-trimethylene carbonate monofilament and polydioxanone monofilament sutures for flexor tendon repair and demonstrated that these materials possess adequate strength under conditions of immobilization.(2,3) It remains unclear whether tendons repaired using these absorbable sutures are able to withstand postoperative mobilization. We evaluated the effectiveness of absorbable flexor tendon repair in combination with active mobilization. Polydioxanone and polyglycolide-trimethylene carbonate monofilament sutures were used and compared in this study.

Forty-eight canine flexor digitorum profundus (FDP) tendons from 24 mongrel adult dogs were used in this study. 12 fresh canine cadaver FDP tendons from 6 mongrel adult dogs that had been sacrificed primarily for other purposes were used as a day-0 control. The specimens were divided into two equal groups, according to whether a polyglycolide-trimethylene carbonate (Group 1) or a polydioxanone (Group 2) monofilament suture would be used.

Operative procedure
Each animal was initially tranquilized with Ketamine (10 mg/kg body weight, injected intramuscularly) and subsequently anesthetized with pentobarbital (15 mg/kg body weight, injected intravenously) as necessary to maintain appropriate anestheisia levels. Under tourniquet control, an L-shaped lateral longitudinal incision was made adjacent to the paw pad. The flexor sheath was excised between the proximal and distal pulleys to expose the FDP tendons in zone 2. The FDP tendons were sharply lacerated into two equal groups, according to whether a polyglycolide-trimethylene carbonate (Group 1) or a polydioxanone (Group 2) monofilament suture were used.

Mechanical testing
All the repaired tendons were secured tightly in tendon clamps on a tensile testing machine and loaded to failure with a 200 N capacity load cell and a gauge length of 40 mm at a constant cross-head speed of 25 mm/min. During distraction of the specimens, a video camera was used to determine the accurate displacement between each of the tendon ends. The force, measured in Newtons (N), at which 3 mm of displacement between each of the tendon ends was observed, was recorded as the gap strength, while the force at which the repair failed was recorded as the ultimate strength.

Statistical analysis of the obtained data was performed using two-way repeated measures analysis of variance (ANOVA) followed by Tukey’s post hoc test to determine the effect of the repair technique as the repeated factor (polydioxanone and polyglycolide-trimethylene carbonate suture) and the postoperative protocol.

RESULTS
No ruptures in any of the specimens were found at any time interval. All specimens revealed a gap of less than 2.0 mm. Large adhesions around the repair site were not seen in all time specimens. Results regarding gap and breaking strengths are shown graphically in Fig. 2 and Fig. 3.

The gap and ultimate strength values of polyglycolide-trimethylene carbonate specimens (group 1) showed a significant decrease at day 14. On the other hand, the gap and ultimate strength values of polydioxanone specimens (group 2) did not show a significant decrease, but showed a significant increase at day 28.

The gap and ultimate strength values of polyglycolide-trimethylene carbonate specimens (group 1) were significantly greater at days 0, but smaller at day 28 than those of polydioxanone specimens (group 2).

DISCUSSION
All the repaired tendon specimens healed without ruptures or large gap formation. Mechanically, the ultimate strength of both polydioxanone and polyglycolide-trimethylene carbonate specimens maintained levels in excess of the average in vivo force on the FDP tendon of 18.6 N, which Schuind et al.(4) reported could be expected during active flexion of a finger. The repaired tendons using absorbable sutures possessed adequate tensile strength enabling active mobilization.

The gap and ultimate strength values of both polyglycolide-trimethylene carbonate and polydioxanone specimens did not decrease during the initial critical 7-day period of tendon healing, but the values of polyglycolide-trimethylene carbonate specimens showed a significant decrease at day 14. The observed loss in tensile strength was probably due to suture absorption than to a softening of the tendon ends.

Polydioxanone monofilament retained its strength longer in the repaired tendons than polyglycolide-trimethylene carbonate monofilament, which is compatible with previous in vivo studies.(5,6)

This combination of absorbable tendon repair and active mobilization had a potential to apply clinical cases.

REFERENCES