

# Evaluation of superior rectus muscle attachment following hang-back recession in rabbit eyes

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**PURPOSE.** *The hang-back suture technique has been advocated to decrease the risk of scleral perforation during strabismus surgery. In this study, we evaluated the muscle insertion site in rabbits 4 weeks after a hang-back recession was performed.*

**METHODS.** *Twenty-five eyes of 13 rabbits underwent hang-back recessions of between 5 and 8 mm of the superior rectus muscle. Four weeks later, the attachment sites were examined.*

**RESULTS.** *Four weeks following the surgery, 14 muscles (n=25, 56%) were anteriorly displaced. In the 5 mm recession group, one muscle was anteriorly displaced (n=7, 14.3%). In the 6 mm recession group, 50% of the muscles recessed were displaced anteriorly (n=8). The 7 mm hang-back recession group demonstrated forward displacement in five muscles operated (n=6, 83%) and in the 8 mm recession group, all four muscles (100%) were anteriorly displaced. The magnitude of displacement was positively correlated to the amount of the hang-back recession performed (Pearson correlation  $p < 0.001$ ).*

**CONCLUSIONS.** *Anterior displacement of muscles using the hang-back technique in the rabbit eye is unacceptably high and occurred in 56% of the cases. A positive, statistically significant correlation exists between the amount of recession performed and the number of muscles displaced from their new insertion. Therefore, when performing large recessions using the hang-back technique displacement should be anticipated. (Eur J Ophthalmol 2004; 14: 464-6)*

**KEY WORDS.** *Hang-back recession, Rabbit, Strabismus*

*Accepted: May 23, 2004*

## INTRODUCTION

Hang-back recession is popular (1) and is the mainstay of adjustable suture strabismus surgery (2, 3). Technically, in hang-back recession, the muscle is not sutured directly to the sclera, but is left hanging back on a suture passed through at the original insertion point. The hang-back technique is advantageous because placing the needles at the original insertion site is technically easier than conventional recession surgery, and reduces inadvertent scleral perforation.

## METHODS

Thirteen New Zealand white rabbits (25 eyes) underwent hang-back superior rectus recession in a study that was approved by the Tel-Aviv University animal review board. All procedures were undertaken in accordance with the Association for Research in Vision and Ophthalmology statement for use of animals. The rabbits were randomized into four groups: 5 mm hang-back recession (n=7), 6 mm hang-back recession (n=8), 7 mm hang-back recession (n=6),

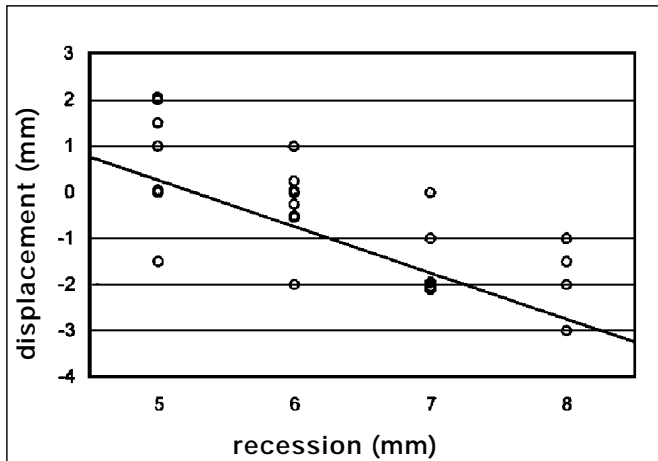


Fig. 1 - The magnitude of muscle displacement 4 weeks after recession by the hang-back technique as a function of the amount of recession at time of surgery. The correlation was statistically significant ( $p < 0.001$ , Pearson correlation).

and 8 mm hang-back recession. A limbal approach was utilized in incising the conjunctiva. Next, the check ligaments and the intermuscular membrane were dissected and lysed and the superior rectus muscle was isolated. A double-armed 6-0 partial thickness Vicryl suture was passed through the muscle. The rectus muscle was then disengaged from the globe and the two arms of the Vicryl suture were passed through the sclera at the original insertion site. The muscle was suspended so that the distance from the limbus to the cut edge of the muscle reached the desired amount of recession and the sutures were then tied. The amount of muscle recession, measured as the distance between the edges of the new muscle insertion and the limbus, was recorded. Four weeks after surgery, the animals were sacrificed and the globe explored. The distance between the actual muscle insertion and the limbus was measured.

**Statistical analysis**

The amount of hang-back recession was correlated to the amount of displacement using the Pearson correlation.

**RESULTS**

Results summarizing the deviation in the reinsertion site 28 days after surgery are summarized in Table I

and Figure 1. The reinsertion site of the recessed muscle using the hang-back technique was found to be displaced in 80% of the cases (20 eyes,  $n=25$ ) (Fig. 1). Following a relatively small recession (5 mm) with the hang-back technique, 14.3% of the muscles were displaced anteriorly (1 eye,  $n=7$ ) and four muscles were displaced posteriorly. In the 6 mm hang-back recession group, 50% of the superior recti muscles were displaced anteriorly (4 eyes,  $n=8$ ) and two muscles were displaced posteriorly. A 7 mm hang-back recession resulted in 83% anterior displacement of the muscles (5 eyes,  $n=6$ ). Finally, an 8 mm recession resulted in anterior displacement of all muscles recessed (100%,  $n=4$ ).

**TABLE I - THE CHANGE IN INSERTION SITE (in mm) OF THE RECESSED MUSCLE 28 DAYS AFTER SURGERY USING THE HANG-BACK TECHNIQUE**

Rabbit N	5 mm	6 mm	7 mm	8 mm
1	1.5	1	-2	-1
2	-1.5	0	0	-3
3	2	0.25	-2	-1.5
4	2	0	-1	-2
5	1	-0.25	-2	
6	0	-0.5	-2	
7	0	-0.5	-2	
Mean	0.71	0.25	-1.5	-1.87
Standard deviation	1.28	0.85	0.83	0.85
Number of eyes	7	8	6	4

- Anterior position relative to planned recession position;  
+ Posterior position relative to planned recession position

The correlation between the amount of hang-back recession and displacement of the muscle was found to be statistically significant ( $p < 0.001$  Pearson correlation).

**DISCUSSION**

In the hang-back technique, the muscle is "hanged" on a suture tied back to the original site of insertion. This enables unintended movement of the muscle insertion, and thereby may adversely affect the desired postoperative result.

Repka et al (4) evaluated this side effect in cynomol-

gus monkeys and found that 75% of the large hang-back recession attachments were within 0.5 mm of the intended site. The muscles were located an average of 0.4 mm anterior to the intended position. Repka et al also performed several very large recessions and found the mean forward reattachment site to be 1.1 mm. Our results confirm the observation that when large muscle recessions are performed, using the hang-back technique increases the risk of anterior movement of the muscle insertion site that may result in undercorrection of the squint. In another report, Repka and Guyton found that in humans the success rate of the hang-back procedure was 74% in comparison to 80% success in conventional strabismus surgery. In this report the hang-back technique results in more prevalent overcorrection (16%) than that attained with conventional strabismus surgery (4%). Subsequently, it was suggested to reduce the amount of recession planned when incorporating the hang-back technique (5).

In the present study, we found drifts toward undercorrection due to anterior displacement of the muscle insertion. As the amount of recession using the hang-back technique increased, the amount of undercorrection and its incidence increased (Fig. 1). Our results, in accordance with those published by Repka et al in monkeys (4), contradict clinical findings in which a tendency toward overcorrection was reported in 16% of the operated cases (3, 5, 6). This contradictory finding between animal research and clinical retrospective data might be elucidated by the fact that other elements, aside from the insertion site, influence the end result of strabismus surgery. Such factors include alterations in the balance of muscle force and are influenced by the development of fi-

brovascular tissue between the sclera and the muscle. Additional clinical data are warranted in order to determine the optimal mode of surgical correction when performing large hang-back recessions.

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