Timing of Postoperative Adjustment in Adjustable Suture Strabismus Surgery

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Purpose: The use of adjustable sutures in strabismus surgery has increased the rate of surgical success. Little data are available on the optimum timing for postoperative adjustment after strabismus surgery. We wanted to compare 2 common practices of adjustable suture technique after strabismus surgery. ***Methods:*** Two comparable groups of 40 patients each, who had strabismus surgery with adjustable suture technique, were prospectively studied. Group A had early adjustment the same day of the surgery about 6 hours after the operation, and group B had late adjustment the next day about 24 hours after the operation. Subjective scoring tables were used to evaluate the pain felt by the patient before, during, and after the adjustment and any difficulties of the adjustment process. Requirements of postoperative pain medications and final alignment 6 weeks after surgery were also compared. ***Results:*** Despite adequate statistical power, no significant differences were found between the groups regarding pain before, during, and after adjustment, difficulties performing the adjustment, and final alignment after 6 weeks ($P > .05$). Both adjustment schedules were equally associated with mild to moderate pain before, during, and after the adjustment. In the first 24 hours after surgery, no overall difference in the use of pain medications was found. Nausea and vomiting in the first 24 postoperative hours were more common in the early adjustment group ($P = .02$). ***Conclusion:*** The surgeon can feel free to choose the timing for postoperative adjustment. However, when performing an early adjustment, the surgeon should be especially prepared to control nausea and vomiting. (J AAPOS 2001;5:178-83)

The debate among strabismus surgeons about the optimal timing for adjustment of extraocular muscle (EOM) position after adjustable suture strabismus surgery has been ongoing. One stage intraoperative adjustable suture technique with the patient under local anesthesia has been advocated.[1-3] Major concerns when considering postoperative adjustment soon after general anesthesia include patient cooperation, vasovagal responses, ease of suture adjustment, and pain during adjustment.[4-8] With the advances in anesthesia, which promotes rapid recovery, and new antiemetic and analgesic medications,[9-14] it would be beneficial to determine the optimum timing for suture adjustment following outpatient strabismus surgery. The 2 most common practices are to perform the adjustment on the same day before discharge or the following morning.[15] The possible advantages of earlier adjustment include that the patient does not return to the hospital the next day; no long sutures are in the eye overnight, causing more irritation; and the surgeon is already in the hospital that day. The possible advantages of later adjustment include more accurate adjustment, better long-term alignment, and absence of anesthetic effects. Our purpose is to compare these practices to determine an optimum timing for adjustment after strabismus surgery.

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PATIENTS AND METHODS

A prospective observational study was carried out in 2 comparable groups, each with 40 patients undergoing adjustable suture technique strabismus surgery. This population of 80 patients had the power of an effect size of 0.63, with an α of .05 and a β of .20. The effect size (ie, the ratio of the difference between the means to the standard deviation) indicates the power of the study.

All surgery was conducted as an outpatient procedure and carried out in the morning, with adjustment performed either the same day of the surgery, 6 to 8 hours postoperatively (group A), or the next day, 20 to 26 hours postoperatively (group B). Group A patients corresponded to 40 consecutive patients from the practice of one of the surgeons (S.J.I.). Group B patients corresponded to 40

consecutive patients from the practice of another surgeon (A.L.R.). The operations were performed by the same surgeon for each group.

All patients underwent the same surgical technique. The surgical protocol was standardized and used a limbal conjunctival approach with radial relaxing incisions. The EOM was exposed and the suture was placed from the middle of the extraocular muscle tendon 1 mm above the sclera and locked at both ends. The needles were inserted within the sclera at each end of the insertion. A double throw knot was placed, followed by a slipknot. Another suture was fashioned as a bucket-handle on the sclera anterior to the tendon insertion for rotation of the eye during adjustment, if necessary. All sutures used were 6/0 polyglactin sutures. The conjunctival wound was partially closed with four, 8/0 dexon sutures. In reoperation cases only, 0.5 mL (24 mg/mL) of dexamethasone was injected around the muscle at the end of the procedure. The eye was covered postoperatively with a dressing until adjustment time. No patches were required after adjustment. Topical tetracaine was applied before adjustment. An independent observer assessed the difficulty of suture adjustment. Topical prednisolone-gentamicin eye drops were used by the patient 3 times per day for 2 weeks after surgery.

The anesthetic management was standardized. For children, 0.5 mg of midazolam was given either orally or rectally. Sevoflurane was used for masked induction. A laryngeal mask airway was inserted. Anesthesia was maintained with a propofol infusion and 60% nitrous oxide and oxygen. The initial propofol dose, 150 μg/kg per minute, was tapered to 100 μg and then 50 μg for the last 10 to 15 minutes. Analgesia and anesthesia were supplemented with 2 to 3 μg/kg of fentanyl and 20 mg/kg of rectal acetaminophen (given just after induction). Prophylactic ondansetron was given to those patients with a history of prior postoperative nausea and vomiting, motion sickness, or extreme anxiety. Postoperative analgesia was provided with intravenous fentanyl, 0.5 to 1.0 μg/kg intravenously every 5 minutes, until the pain subsided.

For adults, the anesthetic protocol was similar. They were given 1 to 3 mg of intravenous midazolam for premedication and underwent an intravenous induction with 1.5 to 2 mg/kg of propofol. A propofol infusion was used for maintenance as described previously, as well as 2 to 3 μg of fentanyl. Ondansetron was used prophylactically for the indications mentioned previously. Doses of 30 to 60 mg of ketorolac were given halfway through the surgery to provide postoperative analgesia. The postoperative pain relief regimen was the same as that for children.

Prescribed oral postoperative analgesia and antiemetic agents were administered as needed by nurses who were unaware of the trial.

Before adjustment, a record of postoperative medication use was made, and the patient was asked to score the degree of pain experienced. This was done on a visual analogue scale with a range of zero to 10: a score of zero indicated that the patient was completely pain free, and a score of 10 indicated that the patient had the most severe pain ever experienced, as described elsewhere by Crandall et al.[16] Second and third pain scores were taken during and at completion of adjustment (Figure).

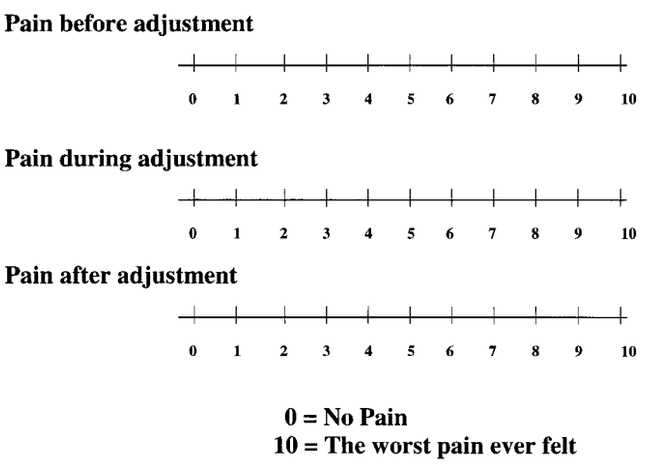

FIGURE. Subjective pain scale.

An independent observer (an ophthalmology resident or a pediatric ophthalmology fellow) assessed the difficulty of the adjustment, ie, repositioning the muscle for either recession or advancement, by using a scale with a range of zero to 5, based on 5 variables: difficulty repositioning the muscle, patient discomfort, pain, vagal symptoms, and complications during the adjustment. One point was given to each variable if it occurred during the adjustment. A score of zero indicated no difficulty and a score of 5 indicated the most difficult adjustment.

Group A was adjusted the same day of the surgery, 6 to 8 hours after the operation, and group B was adjusted on the next day, 20 to 26 hours after the operation. The patients were sufficiently alert and comfortable before discharge. All patients were asked to comment on any specific non-ocular discomfort experienced. Systemic analgesia (paracetamol) was prescribed routinely for postoperative pain relief if required, and its use was recorded.

Alignment was measured preoperatively and postoperatively at 6 weeks in both groups. Successful alignment was defined as 10 PD or less for horizontal deviations and 5 PD for vertical deviations.

RESULTS

The details of groups A and B, including the number of patients, male to female ratio, mean age at surgery, previous history of strabismus or ophthalmic procedures, number of eyes and EOMs operated on, number of EOMs undergoing adjustment, and type of adjustment (advancement or recession), are summarized in Table 1. Of 80

TABLE 1. Surgical data

	Group A		Group B		
	No. of cases	**Mean ± SD**	**No. of cases**	**Mean ± SD**	***P* value**
Preoperative data					
Age at surgery, y	40	38.3 ± 21.4	40	53.7 ± 15.6	.005
Female:male	18:22		19:21		.8
Previous strabismus surgery	19	0.8 ± 1.5	27	1.0 ± 0.9	.6
Operative data					
No. of eyes operated	59	1.4 ± 0.5	65	1.6 ± 0.4	.1
No. of EOM operated	86	2.1 ± 0.7	88	2.2 ± 0.7	.7
Adjustment data					
No. of EOM adjusted	15		21		.2
Amount of recession, mm	10	1.6 ± 0.7	9	1.3 ± 0.5	.3
Amount of advancement, mm	5	2.2 ± 1.6	12	1.1 ± 0.3	.06

TABLE 2. Pain score and analgesic use

	Group A		Group B		
	No. of cases	**Mean ± SD**	**No. of cases**	**Mean ± SD**	***P* value**
Pain					
Pre-adjustment					
Grades					
0	14	0 ± 0	19	0 ± 0	.2
1-3	13	2.1 ± 0.7	12	2.5 ± 0.6	.8
4-7	13	4.4 ± 0.8	9	5.1 ± 1.3	.3
8-10	0		0		
Overall		2.1 ± 1.9		1.9 ± 2.2	.7
Peri-adjustment					
Grades					
0	20	0 ± 0	21	0 ± 0	.8
1-3	16	2.2 ± 0.7	14	2.2 ± 0.6	.6
4-7	4	5.7 ± 1.5	5	5 ± 0	.7
8-10	0		0		
Overall		1.5 ± 1.9		1.4 ± 1.8	.8
Post-adjustment					
Grades					
0	18	0 ± 0	23	0 ± 0	.2
1-3	15	2.0 ± 0.8	14	2.0 ± 0.7	.8
4-7	7	5.4 ± 1.1	3	4.3 ± 0.5	.1
8-10	0		0		
Overall		1.6 ± 1.9		1.0 ± 1.4	.1
	No. of cases	**%**	**No. of cases**	**%**	***P* value**
Analgesic use					
Pre-adjustment					
No oral analgesic		82.5%		45%	
Oral analgesia		17.5%		55%	
Overall					.00008
First 24 hours after surgery (post-adjustment in group A)					
No oral analgesic		44%		45%	
Oral analgesia		56%		55%	
Overall					.8
Nausea and vomiting	9		2		.02

TABLE 3. Adjustment difficulty score

	Group A		Group B		
	No. of cases	**Mean ± SD**	**No. of cases**	**Mean ± SD**	***P* value**
Recession					
Grades					
0	2	0 ± 0	6	0 ± 0	.6
1	5	1.2 ± 0.04	3	1.3 ± 0.5	.3
2	2	2.7 ± 0.3	0		.1
3	0		0		
4	0		0		
5	0		0		
Overall		1.1 ± 1.05		0.4 ± 0.7	.1
Advancement					
Grades					
0	2	0 ± 0	5	0 ± 0	.9
1	1	1.5 ± 0	5	1.1 ± 0.2	.3
2	2	2.7 ± 0.3	1	2.5 ± 0	.1
3	0		1	4.0 ± 0	.4
4	0		0		
5	0		0		
Overall		1.4 ± 1.3		1.0 ± 1.2	.5

patients studied, 43 were men and 37 women. There was a significant difference between groups for mean age at surgery, 38.3 ± 21.4 years in group A and 53.7 ± 15.6 years in group B ($P = .005$, Student t test). The male to female ratio and the number of previous strabismus surgery were similar between the 2 groups ($P > .05$). Fifteen patients in group A and 21 in group B required further adjustment after surgery ($P = .2$). No significant differences were found for the amount in millimeters of postoperative recession ($P = .3$) or advancement ($P = .06$) required between the 2 groups.

The range of pre-, peri-, and post-adjustment pain scores from the visual analogue scale of the 2 groups is presented in Table 2. The data were not significantly different by Student t test and χ^2 test ($P > .05$).

The information regarding the operation, including the amount of pre-adjustment topical and systemic analgesia required and the number of cases of nausea and vomiting, are shown in Table 2. In regards to analgesia, the only finding that was statistically significant between the 2 groups was the number of patients who required oral analgesics postoperatively before undergoing adjustment, 7 of 40 patients in group A and 22 of 40 in group B ($P = .004$). This difference disappeared when we compared the number of patients who required oral analgesia in the first 24 hours after surgery, regardless of the time of adjustment. Nausea or vomiting during adjustment were statistically less common in group B patients ($P = .02$).

Table 3 shows the range of adjustment difficulty score for advancements and recessions in groups A and B. The results were not significantly different in the advancement group or in the recession group ($P > .05$).

For both groups, the final postoperative alignment results 6 weeks after surgery are shown in Table 4. In both groups, more than 80% of the patients were aligned within 10 PD horizontally and 5 PD vertically of orthophoria. They were no significant differences between the groups.

DISCUSSION

We found that more patients who had adjustment the following day required systemic analgesic before adjustment than those who had adjustment the same day ($P = .003$). This difference may be explained by a shorter period of time between the surgical procedure and the postoperative adjustment and the lingering effect of long half-life analgesics administered during the surgical procedure in patients undergoing early postoperative adjustment. No differences were found between the groups in analgesic requirement during the first 24 hours after surgery.

In patients who underwent postoperative adjustment in which further recession or advancement was performed, pain scores and adjustment difficulties were not significantly different between the groups ($P > .05$). The only significant differences that we found were in patients who did not require postoperative adjustment. Of the patients in both groups who had their sutures tied and cut only the day after surgery, group B patients experienced less pain when the sutures were being removed than group A patients ($P = .01$). This difference is not related to the traction on the muscle. Because the patients in group A were younger, they may have had a higher level of anxiety and sensitivity to external factors, such as light, touching, or pressure sensations.

Group B patients had a significantly lower frequency of nausea or vomiting. This difference was significant only for those patients who did not require postoperative adjustment ($P = .02$). Therefore, these vasovagal response symptoms cannot be explained by traction on the muscle. Although this

TABLE 4. Postoperative alignment at 6 weeks

	Group A cases	Group B cases	*P* value
Orthotropia	15/40	17/40	.6
Horizontal deviation < 10 PD	35/40	38/40	.2
No previous surgery	17/21	14/14	.08
Vertical deviation < 5 PD	32/40	34/40	.5
No previous surgery	20/21	14/14	.4

could be an effect from general anesthesia, this difference could also be attributed to the overall younger age of group A, which may predispose this population to nausea and vomiting.

The postoperative alignment at 6 weeks (Table 4) was not significantly different between the 2 groups in our series. Spierer[17] reported no differences in the postoperative alignment after a follow-up period of 19.6 months (6-40 months) between 2 groups of patients who underwent adjustable suture strabismus surgery performed either 8 hours (group 1) or 24 hours (group 2) after surgery.[17]

The surgical technique of adjustable suture in strabismus surgery was popularized by Jampolsky in 1975.[18] With further modifications of the method by different authors,[19-23] this technique has increased the success rate over traditional surgery by 15% to 20% for complicated strabismus, reoperations, and restrictive and paralytic strabismus.[18-26]

Performing postoperative adjustment of the operated muscle may subject the patient to some discomfort, anxiety, and vasovagal or oculocardiac reflexes.[7,8] To address these potential problems, various surgical and anesthetic techniques have been attempted to minimize these factors.

The surgical technique can be performed as either a one or two stage technique, with the use of either local or general anesthesia. In a one stage technique, the surgeon performs adjustment of the suture in the operating room by using topical anesthesia. In a two stage technique, the amount of muscle recession or resection is performed at the time of the surgery and then adjusted some time later. After induction of local anesthesia with either retrobulbar or peribulbar 2% lidocaine combined with hyaluronidase, the operated EOM function required a recovery time of at least 5 to 6 hours after surgery so that the surgeon could properly perform the adjustable technique.[27] Conscious sedation, with the use of either intravenous fentanyl or sufentanil and topical mepivacaine, was found to be a safe and effective alternative to general anesthesia.[28]

In their one stage adjustment with local anesthesia, Ruben and Elston[1] used topical amethocaine 1% and subconjunctival 2% lidocaine with adrenaline over the insertions of the operated muscles in 6 patients. Because 2 patients had severe postoperative pain, they recommended this technique for a single vertical muscle recession due to the limitation of surgical time, visual factors, reduced fixation distance target for the adjustment, and the effect of local anesthesia on muscle contractility.[1]

Biglan et al[2] reported a one stage procedure that used topical proparacaine hydrochloride, subconjunctival mepivacaine hydrochloride over the incision site and near the rectus muscle insertions, and intravenous sedation with a combination of midazolam, fentanyl, and propofol. Two of their 25 patients were converted to retrobulbar anesthesia because of discomfort, and 2 patients developed a secondary deviation because of the spread of the anesthetic. However, in another report of the one stage local anesthetic technique by Rauz et al,[3] 8 patients had vertical muscle surgery only, with minimal discomfort and good alignment postoperatively.

A recent advance in one stage adjustment, which used total intravenous anesthesia with propofol (as an induction and maintenance agent) for strabismus surgery in children, was found to be superior to halothane on the rapidity of recovery and incidence of postoperative vomiting.[9,12,13] Ward et al[9] studied 29 patients who underwent one stage adjustment with total intravenous anesthesia with propofol and mivacurium. All were aligned within 12 PD of orthophoria when adjustment was performed immediately after completion of surgery. They reported that the measured deviation changed 6 PD or less horizontally in 78% of patients and 3 PD or less vertically in 70% of patients. In our study, the postoperative alignment was similar in both groups.

Our experience with propofol for adjustable suture surgery was similar to that of Luff et al.[29] They reported 30 patients who had two stage outpatient surgery with propofol induction, maintained by enflurane and nitrous oxide with a laryngeal mask. All of the patients were adjusted at a mean of less than 5 hours after surgery. Only 1 patient required a postoperative antiemetic medication. No significant nausea was reported before and after adjustment. In our study, only 11 patients had mild nausea and vomiting in both groups.

Holmes and Townshend[15] compared the peak force required for adjustment in adjustable suture surgery performed 15 minutes to 48 hours after the operation in rabbits. The force required for adjustment at 24 hours and beyond was greater than the maximal force generated by the EOM. They suggested that the postoperative adjustment should be performed within the first 24 hours. This animal model study correlated with our clinical series, because the ease of the adjustment was not statistically significant between the 2 groups and nearly all patients were adjusted within the 24-hour period.

In our series, 36 of the 80 (45%) patients required postoperative adjustment. Of those, 24 (66%) had a history of previous EOM surgery. Wygnanski-Jaffe et al[30] reported that 40% of patients will require adjustment after adjustable suture strabismus surgery. This percentage was higher in patients with a history of previous EOM surgery.

In conclusion, the surgeon can feel free to choose the timing for postoperative adjustment. We found no differences between performing adjustment the same day of the surgery or the next day in regards to pain before, during, and after adjustment, to the ease of performing the adjustment, and to the final alignment. The surgeon should be

aware that the patient might need systemic analgesic medications during the first 24 hours after surgery. If performing an early adjustment, the surgeon should be especially prepared to control nausea and vomiting.

References

1. Ruben ST, Elston JS. One stage adjustable sutures: practical aspects. Br J Ophthalmol 1992;76:675-7
2. Biglan AW, Davis JS, Day R, Landsittel D. Prospective investigation of the effectiveness of intraoperative adjustable sutures for correction of strabismus. Trans Am Ophthalmol Soc 1994;94:325-47.
3. Rauz S, Govan JAA. One stage vertical rectus muscle recession using adjustable sutures under local anesthesia. Br J Ophthalmol 1996; 80:713-8.
4. Apt L, Isenberg SJ, Gaffney WL. The oculocardiac reflex in strabismus surgery. Am J Ophthalmol 1973;76:533-6.
5. Isenberg SJ, Blechman B. Oculocardiac reflex during postoperative muscle adjustment [letter]. Am J Ophthalmol 1982;94:422.
6. Apt L, Isenberg SJ. Oculocardiac reflex during manipulation of adjustable sutures after strabismus surgery [letter]. Am J Ophthalmol 1987;104:551.
7. Eutis HS, Eiswirth CC, Smith DR. Vagal responses to adjustable sutures in strabismus correction. Am J Ophthalmol 1992;114:307-10.
8. Hertle RW, Garnet DB, Zylan S. The intraoperative oculocardiac reflexes as a predictor postoperative vaso-vagal responses during adjustable suture surgery. J Pediatr Ophthalmol Strabismus 1993; 30:306-11.
9. Ward JB, Niffenegger AS, Lavin W, Acquadro MA, Ahern DK, Smith PV, et al. The use of propofol and mivacurium anesthetic technique for the immediate postoperative adjustment of sutures in strabismus surgery. Ophthalmology 1995;102:122-8.
10. van der Berg AA, Lambourne A, Clyburn PA. The oculoemetic reflex. A rationalization of postophthalmic anaesthesia vomiting. Anaesthesia 1989;44:110-7.
11. Lim BL, Low TC. Total intravenous anaesthesia versus inhalational anaesthesia for dental surgery. Anaesth Intensive Care 1992;20:475-8.
12. Larsson S, Asgeirsson B, Magnusson J. Propofol-fentanyl anesthesia compared to thiopental-halothane with special reference to recovery and vomiting after pediatric strabismus surgery. Acta Anaesthesiol Scand 1992;36:182-6.
13. Watcha MF, Simeon RM, White PF, Stevens JL. Effect of propofol on the incidence of postoperative vomiting after strabismus surgery in pediatric outpatients. Anaesthesiology 1991;75:566-71.
14. Ding Y, White PF. Comparable effects of ketorolac, dezocine and fentanyl as adjuvants during outpatient anaesthesia. Anesth Analg 1992; 75:566-71.
15. Holmes JM, Townshend AM. Optimum timing of postoperative adjustment in a rabbit model of adjustable suture strabismus surgery. Ophthalmic Surg 1995;26:241-3.
16. Crandall AS, Zabriskie NA, Patel BC, Burns TA, Mamalis N, Malmquist-Carter LA, et al. A comparison of patient comfort during cataract surgery with topical anesthesia versus topical anesthesia and intracameral lidocaine. Ophthalmology 1999;106:606.
17. Spierer A. Adjustment of sutures 8 hours vs 24 hours after strabismus surgery. Am J Ophthalmol 2000;129:521-4.
18. Jampolsky AL. Strabismus reoperation techniques. Trans Am Acad Ophthalmol Otolaryngol 1975;79:704-29.
19. Kraft SP, Jacobson ME. Techniques of adjustable suture strabismus surgery. Ophthalmic Surg 1990;21:633-40.
20. Schwartz RL, Choy AE, Cooper CA. Delayed conjunctival closure in adjustable strabismus surgery. Ophthalmology 1984;91:954-5.
21. Wright KW. Practical aspects of the adjustable suture technique for strabismus surgery. Int Ophthalmol Clin 1989;29:10-5.
22. Nelson LB, Calhoun JH, Harley RD, Freeley DA. Cul-de-sac approach to adjustable strabismus surgery. Arch Ophthalmol 1982; 100:1305-7.
23. Eustis HS, Hesse RJ. Conjunctival reaction using adjustable sutures: a comparison of the cinch and bow knot methods. J Pediatr Ophthalmol Strabismus 1993;30:149-53.
24. Wisnicki HJ, Repka MX, Guyton DL. Reoperation rate in adjustable strabismus surgery. J Pediatr Ophthalmol Strabismus 1988;25:112-4.
25. Flynn JT. The adjustable suture: a clinical experience. Trans New Orleans Acad Ophthalmol 1986;245:210-20.
26. Franklin SR, Hiatt RL. Adjustable sutures in strabismus surgery. Ann Ophthalmol 1989;21:285-8.
27. Brown RD, Pacheco EM, Repka MX. Recovery of extraocular muscle function after adjustable suture strabismus surgery under local anesthesia. J Pediatr Ophthalmol Strabismus 1992;29:16-20.
28. Carruthers JDA, Mills K, Bagaric D. Can adjustable suture surgery be performed with conscious sedation? J Pediatr Ophthalmol Strabismus 1995;32:17-9.
29. Luff AJ, Morris RJ, Wainwright AC. Day case management in adjustable suture squint surgery. Eye 1993;7:694-6.
30. Wygnanski-Jaffe T, Wysanbeek Y, Bessler E, Spierer A. Strabismus surgery using the adjustable suture technique. J Pediatr Ophthalmol Strabismus 1999;36:184-8.

An Eye on the Arts – The Arts on the Eye

... Ibn Khaldun commented on the evil eye, calling it a natural gift, something that is innate and not acquired, not depending upon the free choice of its possessor. He ended his discussion as follows: "Therefore it has been said: 'A person who kills by means of sorcery or a miraculous act must be killed, but the person who kills with the eyes must not be killed.' The only reason for the distinction is that the person who kills with the eyes did not want or intend to do so, nor could he have avoided doing so. The application of the eye was involuntary on his part."

—Alan Dundes (from *The Evil Eye: A Casebook* p 260)