Surgical treatment of anorectal injuries

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We retrospectively studied 40 patients who were admitted to our department with anorectal trauma during 1996-2004. There were 36 male and 4 female patients with a mean age of 24 ± 5.35 (range 20-36 years). We analyzed the injury severity score (ISS) and abbreviated injury scale (AIS) recorded for each patient at the time of admission. The mean ISS was 13.2 ± 7.1 (range 4-38). Mean age was 24 ± 5.35 years (range 20-36). Five patients (12.5%) suffered blunt abdominal trauma, 2 (5%) had stab injury, 8 (20%) were injured with low-velocity bullets, 14 (35%) were injured with high-velocity bullets, 10 (25%) had shrapnel injury and one (2.5%) suffered from a shotgun injury. Twenty-five patients (62.5%) had hemorrhagic rectal discharge. In the operating room, each patient underwent rigid rectosigmoidoscopy under general anesthesia. Isolated rectal injury was detected in 5 patients (12.5%). The associated organ injuries are shown in **Table 1**.

Four out of 11 intraperitoneal rectal injuries were repaired primarily while resection approach was applied to the remaining 7. Prophylactic ostomy was not carried out in 3 out of 4 primarily repaired patients. Two of these 4 cases were stab injuries while the remaining 2 were pistol injuries. One patient for whom an ostomy was applied, had a pistol injury leading to collateral ileum and bladder trauma. In 5 cases where resection was applied, intestinal passage was maintained by end colostomy and Hartman procedure. Of these 5, 2 patients had colorectal anastomosis. In these patients, proximally located prophylactic ostomy aimed to protect the colorectal anastomosis. There were 10 combined intra and extra-peritoneal injuries. These injuries were located between the transition region of intra-peritoneal and extra-peritoneal rectum. Eight of these injuries were treated with resection, 2 were primarily repaired. Primarily repaired injuries were caused by either a pistol injury or a blunt trauma. Only one of the 2 primarily repaired patients had prophylactic ostomy. Nine of 19 extra-peritoneal injuries involved the anal canal and rectal sphincter. Four of 19 extra-peritoneal injuries were treated by primary suturation; 2 of which were caused by blunt trauma while others were injuries involving low-velocity gunshot incidents.

Table 1 - Associated organ injuries.

Organs	Number
Liver	5
Spleen	3
Stomach	4
Bowels	12
Abdominal vascular	6
Pancreas duodenum	2
Colon	5
Genito-urinary	13
Pelvic extremeties	18
Cranium	3
Thorax	4
Total	**75**

Sphincter injuries were operated with an overlap type, and rectal injury sites were sutured through whole layer. Diverting ostomy was applied to 2 of the primarily repaired patients with an overlap sphincter repairs. Fifteen patient injuries involved the anal canal and perineum, or the site of injury was classified as "difficult injury region to reach," for which we did not use any repair or resection, but a diverting ostomy with debridement and local washout was preferred. Two of the patients with anal canal and sphincter injuries were treated with primary closure, while 5 patients were treated with local wound care and dressing only. In these 5, the integrity of the anal canal and rectum was maintained although the full function was not. However, patients were nearly satisfied with the continence obtained following the surgery. We have performed primary rectal repair operations in 10 patients. Six of them, for whom we preferred not to use a protective colostomy, had a rectal AIS between 2-3, and their ISS ranged between 4-17 with an average ISS of 7.5 ± 3.5. We performed a diverting ostomy in 4 patients whose ISS was over 17 and they had other accompanying injuries. Distal rectal irrigation was carried out for all patients with rectal injury in order to provide mechanical cleaning. Pre-sacral drainage was carried out for each patient with an injury located to the combined intra and extra peritoneal site or below the pelvic peritoneum. Eight out of 29 pre-sacral drainage procedures were performed transabdominally while a perineal incision between coccyx and anus was required for 21 patients. To secure safety of colorectal or coloanal anastomoses, and primary repairs, loop ileostomy was performed when needed. In patients with additional

associated injuries located proximal to the repaired rectum, a combined approach including resection, colostomy and Hartman's procedure was preferred. Ceftriaxone and metronidazole were administered to all patients, and tetanus boosters were provided upon admission to the emergency room. In our series, 3 patients died peri-operatively. Mortality was due to disseminated intravascular coagulation in one patient and multi-organ dysfunction syndrome following septic shock in the remaining 2. Eleven patients had one, 3 patients had 2, and one patient had 3 re-laparotomy procedures, while 2 patients' abdomen was left open after the initial laparotomy. The reasons for re-laparotomy were as follows: 3 patients had leakage from their anastomosis, 6 patients developed the intra-abdominal abscess, 2 patients had ileus, 2 patients developed intra-abdominal hemorrhage, 2 patients were operated to take out packing, and one patient had a missed ureter injury, one patient had bile leakage, one patient had necrosis of colostomy site, and for 2 patients, second look laparotomy was electively planned. Five of 7 patients who developed anal incontinence following their injury were successfully treated by Pickrell's operation. One patient was treated by perineal colostomy and Pickrell's operation. A permanent colostomy was applied to one patient for whom integrity of the rectum and anal canal was not achieved. Several authors prefer ostomy to primary repair in high velocity bullet injuries of the colon and rectum.[1] In our series, we performed primary repairs in 10 patients in anorectal injuries. However, none were injured by high velocity bullets. We preferred a diverting ostomy for the protection of primary suture in 4 patients, who had ISS over 17. Six patients treated without a diverting ostomy had ISS below 17. In 6 patients that were treated without a diverting ostomy, we performed distal rectal irrigation with the warm saline solution and presacral drainage. Of these 6 patients, 2 had stab injury, 2 had low velocity gunshot injury and 2 had blunt trauma. Rectal AIS were recorded as under 2, and ISS were recorded between 4-17 in this group. We recognized a purulent discharge from the drain on the fifth day of operation in one patient with the associated pelvic fracture and a recorded ISS of 17. During his first operation, a pelvic fracture and a 2.5 cm extraperitoneal rectal laceration (without whole layer involvement) were detected. At the time of his second operation, a proximal colostomy and debridement of rectal injury side were carried out: presacral drains were applied. Rectal perforation resolved, and secondary healing colostomy was closed after 4 mounts. The other 5 patients were discharged from the hospital without any complication. Fragmentation and deformation effect are common to all high velocity bullet injuries. High velocity bullets also carry cloth, soil and dust particles in addition to bone fragments into the adjacent tissues, all of which serves as a source of infection. Once in the tissues, each small fragment of bullet widely disperses and can easily cause missed intestinal and urinary tract injuries.[2] In our study, we detected a patient who developed urinary leakage due of a similar injury. Many studies regarding anorectal injuries report the importance of diverting colostomy, distal rectal washout, pre-sacral drainage and use of antibiotics. In selected cases, primary suture without an ostomy can be an alternative approach if the injury site is within reach of the surgeon at the time of initial operation.[1,3] Distal rectal cleaning using warm saline has been associated with significantly lower incidence of intra-abdominal abscess, and decreased bacterial colonization.[4] We performed rectal cleaning for all patients after anal canal dilatation. Pre-sacral drainage has helped us to detect any leakage from the anastomoses and primary repairs. Although primary repair has become the treatment of choice for the extra-peritoneal rectal injuries, we performed primary repair only in selected cases. Pelvic infection developed only in one out of 29 patients that we performed presacral drainage. Pre-sacral drainage also helped to recognize anastomoses leakage during the early postoperative period. One patient that developed pelvic infection despite of pre-sacral drainage was operated again, and a loop colostomy was chosen. Injuries to the genitourinary tract, particularly bladder injuries can accompany anorectal injuries.[5] We identified 10 bladder, one posterior urethra and one ureter injury in our series. Bladder injuries were detected at the time of operation and repaired by a 2 layer primary closure. One ureter injury missed at the first operation, was detected with intravenous pyelography. This was repaired with double J catheter, and no major complication was seen later on. Two patients that required repeat laparotomy had initial emergency/ damage control surgery. At the time of their initial surgery, blood pressures were undetectable and ISS were 16 and 18. Morbidity and mortality rate increase in parallel to the time elapsed from injury to the actual operation and amount of blood transfusion unit.

In conclusion, there is no standard approach for managing anorectal injuries. An operation plan must be adopted to each individual patient. Resection and extensive debridement can be the right choice for high velocity bullet injuries. Widespread or devascularizing injuries may require multiple surgical procedures in addition to a diverting colostomy. In selected patients, primary suture and presacral drainage without a diverting ostomy can be attempted.

Rectal injury type, AIS and ISS can help to make this decision. Presacral drainage can help to prevent perirectal infection in extraperitoneal injuries. Distal rectal drainage has value in delayed patients with high velocity bullet injuries, as it helps to decrease the bacterial colonization of perirectal tissues.

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References

1. Shannon FL, Moore EE. Primary repair of the colon: when is it a safe alternative? ***Surgery*** 1985; 98: 851-860.
2. Uzar AI, Dakak M, Saglam M, Ozer T, Ogunc G, Ide T, et al. The magazine: a major cause of bullet fragmentation. ***Mil Med*** 2003; 168: 969-974.
3. Gonzales RP, Falimirski ME, Holevar MR. The role of presacral drainage in the management of penetrating rectal injuries. ***J Trauma*** 1998; 45: 656-661.
4. Shannon FL, Moore EE, Moore FA, Mc Croskey BL. Value of distal colon washout in civilian rectal trauma-reducing gut bacterial translocation. ***J Trauma*** 1988; 28: 989-994.
5. Franko ER, Ivatury RR, Schwalb DM. Combined penetrating rectal and genitourinary injuries: a challenge in management. ***J Trauma*** 1993; 34: 347-353.

Adhesive intestinal obstruction in pediatric patients in Jordan

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Adhesions are a rare cause of intestinal obstruction in children, and one of the challenging problems to the pediatric surgeons as there is still much controversy in the literature on the best management and the timing of surgical intervention. In this study, we reviewed our cases to study the spectrum of presentation and management and to compare our experience with that reported in the literature. The aim of this study was to determine the presentation, etiology, management, and outcome of adhesive intestinal obstruction in children at Jordan University Hospital over a 30 years period

In this retrospective study the medical records of all children diagnosed as adhesive intestinal obstruction (AIO) between 1973-2003 were reviewed regarding age, diagnosis, gender, interval between initial surgery and presentation with AIO, presenting symptoms, initial diagnosis, type of prior operation, treatment and outcome. The total number of patients was 57 patients, 40 males, and 17 females, the male to female ratio was 2.4:1. The age ranged from 2 months to 15 years with an average age of 6.7 years. The clinical presentation includes: vomiting in 48 patients (84%), pain in 43 patients (75%), constipation in 33 patients (58%), and distention in 32 patients (56%). The previous operations leading to AIO are shown in **Table 1**. The miscellaneous operations which contributed to adhesive intestinal obstruction include: laparotomy for colon polyp, fundoplication; bilateral nephrectomy, esophageal replacement, gastrostomy; laparotomy for gastric perforation secondary to foreign body ingestion, Mitrofanoff, staging laparotomy for non Hodgkin's lymphoma; pyloromyotomy; diagnostic peritoneal lavage and mesenteric cyst. The time interval from the initial operation to presentation ranged from 3 days-14 years with an average of 1.38 years; 80% of the patients presented within one year from the initial operation. The patients were treated initially with intravenous fluids, nasogastric decompression and close observation of vital signs; abdominal distension; abdominal tenderness in addition to abdominal radiological findings. The criteria of failed conservative treatment included persistence of abdominal pain, fever, tachycardia, leucocytosis, and localized tenderness. This conservative treatment was successful in 46% (26 patients) of cases; whereas

Table 1 - Previous operations leading to adhesive intestinal obstruction.

Previous operations	No.	(%)
Appendectomy	19	(33.3)
Laparotomy for trauma	6	(10.5)
Congenital diaphragmatic hernia	4	(7)
Intussusception	4	(7)
Hirschsprung's disease	3	(5.3)
Laparotomy for anorectal malformation	4	(7)
Malrotation	2	(3.5)
Splenectomy	2	(3.5)
Miscellaneous	13	(22.8)

54% (31 patients) of the patients did not respond to conservative treatment and required surgical intervention. The operative procedure was adhesiolysis in 27 patients; bowel resection and anastomosis in 2 patients, and 2 patients required stoma formation. Postoperative complications were seen in 11 patients (19.6%) and included 6 episodes of recurrence of intestinal obstruction seen in 5 patients; all treated conservatively; wound infection in 3 patients; colon fistula in one patient; pneumonia in 2 patients; one patient aged 15 months, died soon after surgery due to sepsis. The follow-up period ranged from one month to 7 years with an average of 1.05 year. Although intestinal obstruction in children is a common hospital admission, reports on adhesive intestinal obstruction in children are scarce, only reports on adhesive intestinal obstruction following certain specific operations, such as fundoplication,[1] and appendectomy.[2] Most episodes of bowel obstruction in infants and children are related to complications of congenital anomalies. Postoperative AIO accounts for 5-12% of cases of bowel obstructions in children; this is in contrast with adult patients where AIO comprises 40-60% of cases. Janik et al[3] noted a relative risk of AIO with different surgical procedures; with appendicectomy 0.5%, fundoplication 6.2%, nephrectomy 7.7%, and colectomy 16.6%. Most episodes of AIO occur within 3 months after surgery, and 80% occur within one to 2 years. Recurrence of obstruction occurs in 5-15%. Early surgical intervention and the use of antibiotics are among the recommended measures to lessen AIO. Most reported series show few resections rates. The clinical presentation of AIO is variable, it varies from the non-specific colicky abdominal pain to the classical picture of vomiting, abdominal distention and constipation in a patient with previous laparotomy. In this study, 57 cases of AIO were admitted and treated; appendectomy being the most common previous operation, similar to reports in the literature. Twenty-six patients (46%) responded to conservative treatment similar to most reported series. Thirty-one patients (54%) required surgical intervention: 27 patients required only lysis of adhesions and 2 patients required resection and 2 patients required creation of a stoma. One patient died due to sepsis. The recurrence rate was 15%. Ahlberg et al,[2] followed 791 appendectomy, 8 developed adhesive intestinal obstruction, only 2 required resection and without any mortality. Although most investigators agree on the cardinal signs of strangulation obstruction, abdominal pain, fever, tachycardia, leucocytosis, and localized tenderness, there is a census that failure of conservative treatment in the individual patient is a personal judgment. Janik et al,[3] treated 207 patients conservatively while 131 patients required surgical management. Adhesive intestinal obstruction is a potentially life threatening condition and requires prompt treatment. For many years, it has been stated that there is no place for conservative treatment in infants and children with AIO. To obviate delay in treatment; with its attendant risks increased mortality and morbidity; early surgical intervention was advocated.[4] Akgur et al,[5] treated 149 patients with adhesive intestinal obstruction, 110 patients (73.8%) were cured with conservative trial and 39 patients (26.2%) subsequently required surgical intervention. No adverse occurrences have been observed during or after delayed operations. There was neither strangulated bowel nor mortality both in delayed operation and in the conservatively treated group. The place of conservative treatment in the selected patient is safe, as long as signs of bowel ischemia are absent. Such treatment is not associated with higher morbidity and mortality. Most reported episodes of adhesive bowel obstruction in children, including ours, occur within 3 months postoperatively. Although mortality is low, the morbidity is still high with recurrence as high as 5-15% average 7.6%. Postoperative complications were seen in 11 patients (19.6%) and include: recurrence in 5 patients; wound infection in 3 patients; colon fistula in one patient; and pneumonia in 2 patients.

From our study and previous studies, it seems that certain operations carry a higher risk of postoperative AIO than others. These are perforated appendicitis, patients with gastroschisis and malrotation, patients with Wilms tumor associated with spillage, or postoperative radiation, patients with fundoplication with added procedures such as incidental appendectomy, or Ladd's procedure and gastrostomy. Although this is a retrospective study, the number is small; still it represents the wide spectrum of causes of AIO, and supports the general guidelines of management, and with an acceptable complication rates. Whether laparoscopy can diminish adhesion formation and thereby the risk of intestinal obstruction, further studies with long-term follow up will hopefully give us the answer.[6]

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References

1. Wilkins BM, Spitz L. Adhesive obstruction following Nissen Fundoplication in children. ***Br J Surg*** 1987; 74: 777-779.
2. Ahlberg G, Bergdahl S, Rutqvist J, Soderquist C, Frenckner B. Mechanical small bowel obstruction after conventional appendectomy in children. ***Eur J Pediatr Surg*** 1997; 7: 13-15.
3. Janik JS, Ein SH, Filler RM, Shandling B, Simpson JS, Stephens CA. An assessment of the surgical treatment of adhesive small bowel obstruction in infants and children. ***J Pediatr Surg*** 1981; 16: 225-229.
4. Al-Salem A. Adhesive intestinal obstruction in infants and children. ***Saudi Med J*** 2003; 24 :791-793.
5. Akgur FM, Tangel FC, Buyukpamukcu N, Hicsonmez A. Adhesive small bowel obstruction in children: the place and predictors of success for conservative treatment. ***J Pediatr Surg*** 1991; 26: 37-41.
6. Van Derzee DC, Bax NM. Management of adhesive bowel obstruction in children is changed by laparoscopy. ***Surg Endosc*** 1999; 13: 925-927.

Medium term outcomes of strabismus surgery in patients with monocular dense amblyopia

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It is generally believed that the patients with strabismus and dense amblyopia could not maintain the alignment of the ocular axes for a long time after surgical correction of the strabismus. These patients do not usually have sensorial binocularity, and strabismus can possibly recur after surgery. Worth stated that "eventual postoperative divergence is most to be feared in amblyopic eyes. Often they diverge without any operation."[1] Burian and Von Noorden[1] stated that "surgical results in sensory esotropia are quite unpredictable; overcorrections or undercorrection occur frequently, and surgical alignment is rarely stable". However, one cannot see such information in new editions of the same author's textbooks. There are not many reports in the literature regarding this particular topic.[2-4] In one study, Edelman and Brown[2] have shown that the surgical results of these patients are markedly satisfactory in long term. In another study, Maruo et al[4] found that 21% of esotropic patients showed over- or undercorrection at one month postoperative examination, and 40% of patients at 4 years; while 13.5% and 32% of exotropic patients showed unsuccessful results at the same postoperative periods. In this study, we aimed to examine the medium term outcomes of strabismus surgery in patients with deep amblyopia in one eye. The charts of all strabismus surgery patients operated between 1994 and 2002 at our institution were screened, and those that met the following inclusion criteria were included into the study: 1. visual acuity (VA) of 0.1 (Snellen) or less in the amblyopic eye and good VA (0.8 or better) in the fellow eye. 2. At least 2 years of postoperative follow-up period. 3. No evidence of sensorial fusion. 4. No marked possibility of improvement in amblyopia with treatment. The patients under 6 years of age were not included due to the consideration of the possibility of improvement in amblyopia. The young patients included into our study were given occlusion therapy of the good eye; but only unresponsive patients with a resulting VA of 0.1 Snellen or less in the amblyopic eye were included. The patients with paralytic strabismus or dissociated vertical deviation were also excluded. All patients were examined at preoperative and during follow-up. Preoperatively, a full ophthalmic examination including cycloplegic refraction and ophthalmoscopy was carried out for each patient. The strabismus angle was measured with full refractive correction at near distance using the Krimsky test, as it is the only reliable method for measuring the angle of deviation in patients with dense amblyopia. The patients were examined at first and 7 days, 2 and 6 months, and then with one year apart, as possible. Any change in the direction or angle of the deviation between early and last postoperative examinations were recorded and compared individually for each patient. We accepted the postoperative 2 months examination as the earliest stable measurement time. A postoperative deviation within ± 12 prism diopter was accepted as successful. The follow-up period was defined as the time interval between 2 months postoperatively and the last measurement. The analysis were carried out with the Statistical Program for Social Sciences 11.0. The group distribution was tested with Kolmogorov Smirnov test (non-parametric test). For all groups distributed normally, parametric tests were used. A *p*-value less than 0.05 was considered as statistically significant.

Sixty-nine patients with monocular amblyopia and having strabismus surgery were found. However, only 33 patients fulfilled the inclusion criteria (18 males and 15 females), and were included into the study. The remaining 36 patients had not enough follow-up or were lost during the follow-up period. Of 33 study patients, 22 (67%) had esotropia, and 11 (33%) exotropia, preoperatively. The mean age was 21.5 ± 12.5 (range: 8-61 years) at the time of

Table 1 - The preoperative and postoperative data of the patients with monocular amblyopia.

Patient's no.	Age	Gender	Type of strabismus	Angle of deviation (prism diopter)			Follow up (months)	Operation	Corrected VAof amblyopic eye
				Pre operative	Postoperative (2 months)	Last postperative			
1	13	Male	RET	45	OT	OT	24	Right R&R, RIO Rec	0.05
2	15	Female	LET	60	OT	OT	30	Left R&R	0.1
3	18	Male	RET	45	RET 20	RET 20	24	Right R&R	0.05
4	21	Female	LET	45	OT	OT	24	Left R&R	0.05
5	10	Female	LET	30	OT	LET 14	24	Left R&R	4 mfc
6	19	Female	RET	40	OT	RET 8-10	45	Right R&R	0.1
7	8	Female	RET	90	RET 20	RET 40	48	Right R&R	0.5 mfc
8	11	Male	LET	45	LET 10	LET 20	36	Left R&R	0.05
9	16	Male	LET	40	LXT 20	LXT 14	38	Left R&R	0.1
10	20	Female	RET	25	OT	RXT 30	87	Right R&R	1 mfc
11	14	Male	RET	10	OT	OT	60	Right R&R	0.1
12	28	Male	LET	30	ET 8	OT	105	Left R&R	1 mfc
13	9	Female	LET	65	LET 18	LET 18	63	Left R&R	0.1
14	43	Female	LET	55	LET 25	LET 25	63	Left R&R	1 mfc
15	39	Male	LET	60	XT 10	OT	30	Left R&R	4 mfc
16	17	Male	LET	65	LET 6-8	LET 12	43	Left R&R, RSO Ten.	2 mfc
17	16	Female	RET	50	RET 10	RET 25, RHT 4	25	Right R&R	0.05
18	16	Female	RET	40	RET 8	RET 10	29	Right R&R	0.1
19	15	Male	RET	30	RET 14	RET 14	29	Right R&R	0.05
20	8.5	Male	RET	50	OT	RET 6	24	Right R&R	0.05
21	17	Male	LET	40	LXT 10	LXT 10	27	Left R&R	0.1
22	26	Male	RET	53	OT	OT	66	Right R&R	0.05
23	27	Male	LXT	25	OT	OT	78	Left R&R, LIO Rec	0.1
24	8	Female	LXT	30	OT	OT	28	Left R&R, BIO Rec	0.1
25	61	Female	LXT	45	RHT 2-4	RHT 2-4	43	Left R&R	0.05
26	28	Male	LXT	30	XT 10	XT 10	108	Left R&R	5 mfc
27	26	Male	LXT	25	OT	OT	60	Left R&R	0.05
28	38	Male	LXT	45	LXT 14	LXT 25	36	Right R&R (2 surgery)	1 mfc
29	17	Male	LXT	40	OT	RET 4	64	Right R&R (2 surgery)	0.1
30	16	Male	RXT	45	RXT 25	RXT 30	24	Right R&R	0.1
31	11	Female	LXT	35	LXT 6	LXT 10	49	Left R&R, LIO Rec	0.1
32	40	Female	RXT	66	RXT 35	RXT 30	72	Right R&R	0.05
33	39	Male	RXT	30	RXT 10	RXT 14	80	Right R&R, RIO Rec	0.05

RET - right esotropia, LET - left esotropia, LXT - left exotropia, RXT - right exotropia, OT - orthotropia, RIO - right inferior oblique, BIO - bilateral inferior oblique, LIO - left inferior oblique, R & R - recession and resection of the same eye, RSO Ten - tenotomy of right superior oblique, mfc - meter finger counting, VA - visual acuity, RHT - right hypertropia

the surgery. Four patients had previous strabismus surgery (one consecutive exotropia). The causes of amblyopia were anisometropia in 3 patients, ptosis and strabismus in one patient and strabismus in the remainders. A unilateral recession/resection procedure was performed on the amblyopic eye in 31 patients and on the good eyes in 2 patients. In 5 patients, additional inferior oblique muscle and in one patient, additional superior oblique muscle weakening procedure were carried out. The mean follow-up duration was 48.06 ± 24.25 months (range 2-9 years). A deviation less than 16 prism diopter was present in 26 (79%) patients at 2 months and in 23 (70%) patients at the last examinations. The results of these patients were accepted as successful and all were satisfied with the result. At last examination, there was little change (within ± 12 prism diopter) from the baseline 2 months postoperative examination in 29 patients (88%). A deterioration of 14 prism diopter or more from the baseline 2 months examination was found during the follow-up period in 4 (12%) patients. These patients were all primarily esotropic. **Table 1** shows the differences from 2 months postoperative through follow-up period for each patient. All patients had a stable VA in the amblyopic eye through the postoperative period. Mean preoperative deviation was 43.2 ± 15.6 prism diopters. Mean early and last postoperative deviations were 8.6 ± 9.3 and 12.02 ± 11.31 prism diopters. The difference between early and last postoperative deviations was not significant

(p>0.05). When esotropia and exotropia cases were taken into consideration separately, 4 of 22 esotropic patients (18%) showed a significant deterioration from the baseline 2 months postoperative deviation, while no exotropic patient showed significant deterioration (p<0.05).

Based upon this study, it seems to be that most patients with monocular deep amblyopia can maintain their surgical alignment of visual axes in a mean follow-up of 4 years. Edelman and Brown[2] have shown that the surgical results of these patients are markedly stable and satisfactory after a mean follow-up of 6 years. The authors have found an average of 75.2% corrected deviation 6 months postoperatively as compared with 74.9% over the follow-up period.[2] They reported that 61% of their patients remained quite stable, changing their deviation from 0-10%.[5] In our study, the deviation had been corrected within 15 prism diopter in 26 patients (79%) 2 months postoperatively and in 23 patients (70%) over the follow-up period. Maruo et al[4] reported that initial postoperative successful alignment deteriorated in 21% of 30 esotropic, and in 23% of 19 exotropic patients after 4 years.[4] Our results are consistent with these reports. In our study, a deterioration of 14 prism diopter or more in the deviation was found during the follow-up period in 4 patients (12%). Even though the strabismus may recur or a consecutive strabismus may develop years after the operation, these are not the rules and surgical alignment of a sensory deviation may assure a stable result for a long time in many patients. Many ophthalmologists hesitate to carryout surgery in monocular amblyopic patients due to the near possibility that the amblyopic eye may eventually deviate again. However, this is not the rule and surgical alignment of a sensory deviation will provide a stable long-term result in many patients. Also if that occurs, reoperation can be performed. Edelman and Brown[2] reported, in their study, that 2 of 36 patients required a second operation. In our study, only 2 or 3 patients were unhappy with the result from the cosmetic point of view, and they declined further surgery in a mean follow-up of 4 years. Despite of the limited number of patients, it seems to be that our esotropic patients have more tendency to recur or deteriorate in deviation than exotropic ones. Again, even though the sample size is small, previous strabismus surgery seems to not affect the long-term outcome. Further studies with larger patient numbers will enlighten us on those issues. Also, the outcomes of the surgery on the good eye seem to not differ from the surgery on the amblyopic eye. Four years follow-up is long enough to advocate or advise surgery in monocular amblyopic patients in terms of medium to long-term stability. Uemura et al[5] reported that the Japanese Association of Strabismus and Amblyopia established the standard of discussing the results of strabismus treatment 4 years after the treatment. Edelman and Brown[2] have reported 6 years mean follow-up and felt that the surgical results in these patients appeared to be stable enough.

In conclusion, our results indicate that most patients with monocular dense amblyopia can maintain a satisfactory surgical alignment for follow-up ranging from 2-9 years.

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References

1. Burian HM, Von Noorden GK. Binocular vision and ocular motility. St. Louis: CV Mosby Co; 1974. p. 298.
2. Edelman PM, Brown MH. The stability of surgical results in patients with deep amblyopia. ***Am Orthopt J*** 1977; 27: 103-106.
3. Rayner JW, Jampolsky A. Management of adult patients with large angle amblyopic exotropia. ***Ann Ophthalmol*** 1973; 5: 95-99.
4. Maruo T, Kubota N, Iwashige H, Kamiya Y. Long-term results after strabismus surgery. ***Graefes Arch Clin Exp Ophthalmol*** 1988; 226: 414-417.
5. Uemura Y, Tsutsui J, Maruo T, Inatomi A, Kozaki M, Watanabe M, et al. Treatment standards for strabismus. ***Jpn Rev Clin Ophthalmol*** 1978; 72: 1408-1414.