Repeated Reconstructive Surgeries for Postoperative Complications of Anorectal Malformations in Children

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Abstract

The causes of postoperative complications in the correction of anorectal malformation were studied according to follow-up, general clinical and additional research method in 65 operated sick children. In the process of diagnosis and surgical correction, a number of diagnostics, tactical, and combined errors and shortcomings were identified that caused postoperative complications, which required a large number of repeated reconstructive operations. The authors recommend various options for tactical and operational - technical treatment approaches when solving the problems of repeated reconstructive operations. At the same time, it is proposed to study the causes, analyze errors, complications and failures, indications, terms, accesses, the volume of the operation and evaluate their effectiveness. The authors, thanks to the optimization of tactics, method of surgical and rehabilitation treatment, were able to improve the results of postoperative complications to 81.4%.

In the course of the study of catamnestic and examination data 65 of children with postoperative non-NAS in the process of diagnosis and surgical correction errors and deficiencies were revealed as: unreliable primary diagnosis, insufficiency of preoperative preparation, inadequate indication and choice of the method of operation, inadequate postoperative rehabilitation. All these had diagnostic, tactical, technical and combined character, which led to the formation of the postoperative HCA, which required a large number of repeated operations. Therefore, the authors suggest that to solve the problems of repeated operations is not limited to the improvement of surgical techniques, and to study the causes, analysis of errors, complications and failures that lead to repeated interventions, indications, timing, access, scope of surgery and their evaluation of effectiveness, medical and social rehabilitation of patients.

The authors, thanks to the optimisation of tactics, method of surgical and rehabilitation treatment, managed to correct the post-surgical NAC up to 80,4%.

Keywords: *Anorectoplasty, postoperative complications, anorectal malformation. Children, proctoplasty, postoperative failure of anal sphincter, anorectal malformations.*

Introduction

In the surgical treatment of anorectal malformations (ARM), reducing the number of postoperative complications (PC) remains a problem in pediatric surgery[18], which is far from being resolved[11] .According to the literature[1], after the initial surgical correction of the ARM, functional disorders of the sphincter apparatus of the rectum occur in 30-60% of patients, subsequently[9] accompanied by fecal incontinence and chronic constipation[2].

At the same time, the main cause of unsatisfactory results[10] in the treatment of ARM are diagnostic[6], tactical and technical errors[15], which often lead to anal incompetence (AI)[5] in children which requires repeated reconstructive surgery (RRS). Therefore, the optimization of surgical tactics, indications and the choice[18] of RRS method to reduce complications of ARM in children is an urgent problem in pediatric colorectal surgery[20].

The objective of the study was to improve the results

of repeated[4] reconstructive surgery for postoperative complications of ARM, based on[11] a study of the causes of complications, ways to optimize diagnosis, treatment tactics and develop preventive measures in children[17].

Materials and Method

For the period 2007-2020 In the departments of pediatric surgery 1st CCCH in Tashkent and MACH in Samarkand (clinical bases of the Department of Pediatric Surgery TashPMI and SamMI), 65 patients were hospitalized for re-correction of complications of ARM. The age of patients is: 3 - 12 months. - 6 (9.2%); 1-3 years - 27 (41.5%); 3 - 7 years - 20 (30.7%); 8-14 years old - 9 (13.8%); 14 - 18 years old - 3 (4.6%). A total of 139 RRS were conducted, of which: twice in 30 (46.1%); three times in 20 (30.7%); four times or more in 15 (23.9%) cases. At the same time, surgical approaches were: STD - 14; ASARP - 23; PSARP - 21; PP-81. The colostomy before RRS was imposed on 37 (57%) patients. Boys - 28 (43%) and girls - 37 (57%).

Concomitant pathologies and regional malformations had been noted in all re-operated, in 18 (40%) patients: agenesis and aplasia of the coccygeal and sacrococcygeal vertebrae, disorders of the innervation of the pelvic organs due to thickening of the terminal filament and spinal cord, etc.

Comprehensive examinations were carried out for all patients: general clinical examinations (medical history, follow-up, clinical examination with rectal examination and laboratory diagnostics); radiological (irrigography, fistulography); additional (ultrasound with doppler, MRI of the abdominal cavity and pelvis, electromyography of the sphincter apparatus of the rectum, rectal reflex and endoscopy). At the same time, we revealed defects, tears, relative thinning of the width, shortening of the length and asymmetry of the puborectal muscles and the external anal sphincter.

We carried out a clinical analysis of the causes of the occurrence of PC in the primary and repeated correction of ARM; The diagnostic tactical and technical errors that were made, the risk of complications during the operation were studied, and optimal method for their repeated correction were developed.

Patients had been divided into two groups. The first group consisted of 47 (72.3%) patients, the use of operations, against the background of mistakes and complications after the initial radical and repeated corrective surgery, leading to anal incompetence (AI). The second group - 18 (27.7%) of patients, against the background of combined regional malformations and congenital inferiority of the obturator apparatus of the rectum.

The study was carried out in accordance with the principles of the Declaration of Helsinki. The study protocol was approved by the Local Ethics Committee of all participating institutions. Parents of the children had been informed about the studies and agreed to carry them out.

Results and Discussion

In the course of studying follow-up and clinical examination data of patients, the causes of complications in the correction of ARM, the clinically manifested AI (fecal incontinence) and stenosis of the anus and rectum (constipation), which needed to be carried out, were identified.

The identified causes of mistakes and complications were diagnostic, tactical, technical and combined.

I. Diagnostic: unreliable verification of diagnostics; insufficient assessment of malformations of neighboring organs; X-ray: improper laying of the patient or the absence of a mark on the anus when determining the height of atresia and the extent of stenosis, omission of deviation of the anorectal angle; clinically unrecognized congenital rectourethral fistula (RUF) and anus ectopia; inaccurate identification of anomalies in the initial diagnosis; inadequate identification of the causes and analysis of complications arising from the primary radical correction of the ARM; unreliable verification of the diagnosis during secondary correction.

II. Tactical: lack of preoperative preparation; wrong choice of indications; inadequate choice of operational access; non-optimal choice of the method of radical surgery or colostomy during the correction of the defect and in the event of complications; excessive attempt to search for perineal access to the high atresized end of the intestine; Inadequate postoperative rehabilitation and lack of surgeon qualifications.

III. Technical: defective implementation of the primary radical classical form of operation technique; damage to the muscles of the sphincters; underestimation

of the anomalies of the arcade vessels, significant intersections of the major major vessels, too much tension or overextension of the mesenteric vessels during mobilization of the colon; extrafincter reduction of the distal part of the colon; accidental wound of the urethra with repeated mobilization of the colon; inferior fixation of the intestine during reduction; defective mobilization of the fistula, insufficient implementation of the plastic technique in rectovestibular (RVF) and RUF; technical mistakes during repeated operations.

IV. Combined, this type includes combinations of two or more types of groups of mistakes and complications at the same time. In some cases, the diagnostic mistakes made led to tactical ones, and they, in turn, to technical ones.

The results of the study showed that the causes of AI in the postoperative period were identified in the group of patients and are directly related to diagnostic, tactical and operational-technical errors (Fig. 1-2).

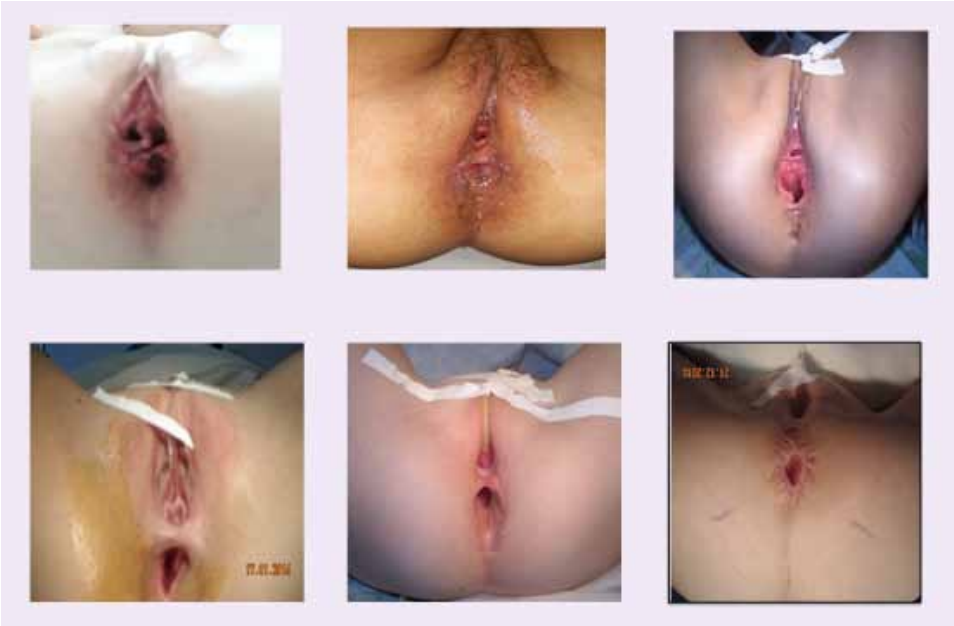

Fig. 1. Postoperative AI due to diagnostic, tactical, technical mistakes and complications in the correction of low forms of ARM

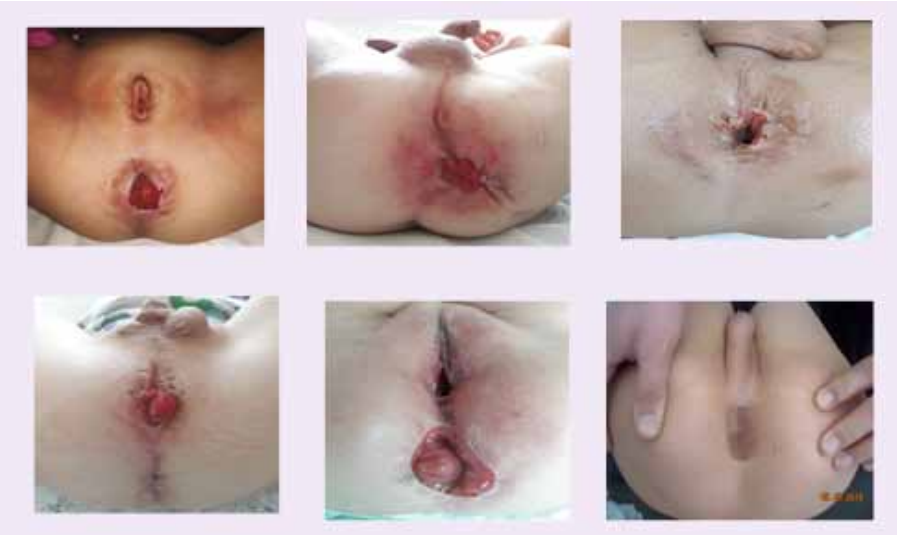

Fig. 2. Postoperative AI due to diagnostic, tactical, technical mistakes and complications in the correction of high forms of ARM

In the other group, not related to them: a combination of malformations of the nerve trunks, plexuses and fibers, defects in the distal part of the spine and chair, anomalies of neighboring organs.

The first group of causes of postoperative AI included intraoperative trauma, unsuccessful re-correcting operations and purulent-inflammatory complications due to diagnostic, tactical and technical errors that led to stenosis or dystopia of the anal canal, deformation of the perianal region, extinction of the mucosa of the reduced intestine, relapse of the fistula into the urinary tract or the reproductive system in children.

The second group of causes of postoperative AI was revealed in the background: disorders of the innervation of the pelvic organs due to thickening of the terminal filament and spinal cord in 4 cases; underdevelopment of the caudal vertebrae (aplasia or agenesis of the sacrum and coccyx) - in 10; underdevelopment of the muscular structures of the sphincter apparatus (aplasia or hypoplasia of the muscle complex) - in 4. These concomitant pathologies had been found among 18 operated patients in a separate and combined form (Fig. 3).

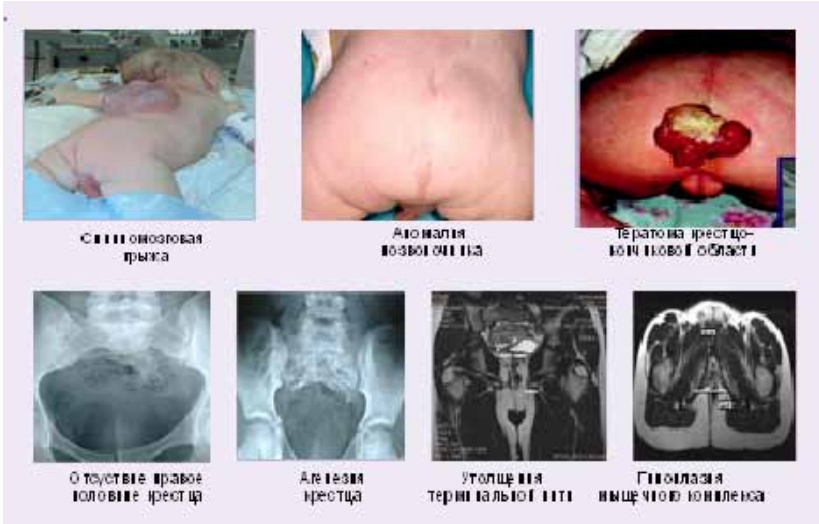

Fig. 3. Uncontrolled AI against the background of violation of the innervation of the pelvic organs, underdevelopment of the caudal spine and muscle structures of the sphincter apparatus.

In these groups of patients, despite an ideally performed primary radical anorectoplasty or RRS, AI was constantly left with the clinical course of fecal incontinence.

Thus, after the initial and repeated ARM correction, all PC for the period differs by: early and late.

Early Complications Include:

– *Suppuration with divergence of sutures of the perineal wound* - with poor-quality preoperative preparation, poor care and management of patients in the postoperative period.

– *Necrosis of the stump of the reduced intestine* - as a result of underestimation of the anomalies of the arcade vessels, significant intersection of the major vessels, too much tension or overextension of the mesenteric vessels in STDs, leading to impaired blood supply in the reduced intestine, its necrosis and sometimes pelvic peritonitis in the early postoperative period

Late Complications Include:

– *Stenosis* of the *anus and rectum*, *secondary megarectum* - arising in the late term, with a long inflammatory process in the area of the perineal wound, chronic ischemia of the wall of the reduced colon and after multiple perineal and peritoneal perineal proctoplasty, which clinical is manifested by chronic constipation.

– *Cicatricial deformity of the anus, cicatricial degeneration of the external sphincter and defects*

of the perineal septum in the form of an "artificial cloaca" ***- arising after a cicatricial process due to impaired blood supply to the wall of the reduced intestine and after multiple perineal proctoplasty due to relapse of the fistula, which clinical manifests by fecal and gas incontinence.***

– *Excess (standing) of the reduced intestinal mucosa* that arose after various types of proctoplasty and with technical errors in the formation of the neonus. The excess mucosa was represented by a small area or a large fragment of it, which clinically proceeds with fecal incontinence

– *A pararectal fistula* arising against the background of increased pressure by fecal masses in the rectum or clogging of it with "stones", with retraction of the reduced intestine, with an enema to create a false move. It usually opens far from the anus or gluteal region, which clinically occurs with fecal incontinence.

On the basis of complex method of examining patients and using ultrasound, MRI and EMG, we revealed anatomically: localization of defects, tears, relative thinning of the width, shortening of length, asymmetry and physiologically: impaired contractility of the puborectal muscles and external anal sphincter.

These data made it possible to assess the degree of damage to the sphincters in postoperative AI, to determine the tactics of choosing method for repeated surgical correction, intraoperative and postoperative measures for the prevention of complications.

In tactical terms, in all cases, in order to improve blood circulation and reduce the scar process, stiffness of perineal tissues, restore the tone of sphincter muscles of the 2-3-degree AI, a stage rehabilitation treatment was performed before each RRS. The rehabilitation treatment complex included: electrophoresis with lidase, electrical stimulation (ESM) of the anal sphincter and pelvic floor, LED laser in a separate and combination form. A sigmostomy, transversostomy and colostomy were applied in 57% of patients as a preoperative preparation. This allowed to improve the clinical results of surgical treatment by 2 times compared with the RRS

When conducting missile defense in the anorectal region, anterior and posterior sagittal access was often used, which allowed intraoperatively assessing the damage state, eliminating the defect of the sphincter of the anus and under visual control of plastic surgery. At the same time, muscle structures, blood vessels and nerves with minimal blood loss are minimally injured; local tissues are used to the maximum to restore the sphincter apparatus; significant mobilization of the rectum, which made it possible to carry out sphincteroplasty and sphincterolevoplasty and allowed to avoid excessive STDs.

The types and number of late complications leading to AI and the choice of RRS method in children are presented by us in table 1.

Table 1: Types and number of late postoperative complications and method of repeated surgical correction in children.

№	Types of postoperative complications	Amount-%	Method for repeated correction
1	Reduced stenosis of the anus and rectum	11 -16,9%	Elimination of stenosis with reconstruction of the anus and rectum
2	Extended stenosis of the anus and rectum	5 -7,6%	APR Elimination of extended stenosis with reconstruction of the anus and rectum.
3	Cicatricial deformity of the anus	7 -10,7%	Sigmostoma. Elimination of cicatricial deformity with reconstruction of the anus
4	Cicatricial deformity anus and vagina	4 -6,1%	Sigmostoma. Elimination of cicatricial deformity of the anus with reconstruction of the perineum
5	Defect of the rectovaginal septum	6 ()	Sigmostoma. PSARP. Sphincterolevatoroplasty
6	Acquired «Esthetic cloaca»	2 -3%	Sigmostoma. PSARP. Staged anorectoplasty

№	Types of postoperative complications	Amount-%	Method for repeated correction
7	Relapse of the RVF	8 -12,3%	Sigmostoma. PSARP. Stone's anorectoplasty.
8	Relapse of the RUF	3 -4,6%	Transversostomy. Epicystostomy. APR with the elimination of RUF
9	Acquired "Dystopia of the anus"	4 -6,1%	Displacement of the dystopic anus. Sphincteroleoplasty
10	Extrasphincterous lowering of the colon	4 -1%	APR With repeated lowering of the colon
11	Acquired pararectal fistula with anus deformity	2 -3%	Elimination of pararectal fistula Sphincteroplasty with reconstruction of the anus
12	Protrusion of the mucosa of the lowered intestine	7 -10,7%	Ablation of the protrusion of the mucosa of the lowered intestine
13	Deformation of the anus with cicatricial degeneration of the external sphincter	2 -3%	Transversostomy. APR with excision of cicatrix. Sphincteroplasty
	Total	65 -100%	100%

When conducting RRS in order to reduce postoperative AI, we drew attention to the following tactical aspects of a local nature: determining the degree of damage to the sphincter of the anus and rectum; the nature of cicatricial deformity of the anorectal region; the degree of protrusion of the mucosa, optimization of indications, choice of method, timing, ways of access to surgery. At the same time, ensure the preservation of the sphincter apparatus of the rectum; understand the intricacies of topographic and anatomical relationships of the perineum; to conduct adequate rehabilitation treatment and restoration of the physiological state of the newly created neo-anus and rectum.

In cases where there was no damage to the sphincter of the anus and direct and severe deformity, treatment was started with rehabilitation measures and only with inefficiency, RRS was performed.

In the presence of deformity (stenosis, ectopia, fistulas, defects) and mucosal standing, direct indications for RRS were determined regardless of the degree of damage to the sphincters.

When conducting RRS in children, we had based on the following techniques and intraoperative treatment tactics:

– If it possible, do correcting complications without abdominal access;
– Rehabilitation treatment was performed in the preoperative period to restore blood supply and innervation of the perineum;
– Strive for minimal tissue dissection when access to perineal;
– Exact removal of the rectum through the center of the retaining muscle complex;
– Strive to restore the anorectal angle with anorectoplasty, by maintaining the balance between puborectal and anococcygeal muscles;
– To ensure the elimination of tension of the reduced intestine in the area of the newly formed neo-anus.

It should be noted that RRS in children is performed in more difficult conditions than primary, and with less ability to perform proctoplasty in a classic form, with gross cicatricial changes in perineal tissue and chronic ischemia of the intestine. Moreover, with each repetition of RRS, the situation begins to deteriorate prognostically. Therefore, we recommend that in difficult situations (defects, cicatricial deformities) with pronounced AI for the effectiveness of RRS, it is imperative to apply a colostomy, conducts rehabilitation and comprehensive treatment of anemia and inflammatory diseases of the genitourinary, respiratory and cardiovascular systems.

Tactical moments of a general nature. This tactical approach significantly improved treatment outcomes with a decrease in the number of reoperations in children.

Thus, due to optimization of diagnostics, preoperative preparation tactics, method of intraoperative surgical correction, postoperative measures for the prevention of complications and rehabilitation, we obtained significant improvements in the results of treatment of postoperative AI. Long-term treatment results were rated as good, satisfactory and unsatisfactory.

The results of surgical treatment of postoperative NAS in children are presented in table 2.

Table 2: Results of surgical treatment of postoperative AI

Pathological conditions of complications by degrees of AI	Method of RRS	Results (Amount and %)			Total (%)
		Good	Satisfactorily	Unsatisfactorily	
1. AI of 1-degree, without significant damage to muscle structures and deformities of the anus.	Conservative (rehabilitation) treatment	16-23,2%	5-8,9%	-	21-32,2%
2. AI of 1-2 degrees, without significant damage to muscle structures, protrusion of the mucosa.	Removal of excess mucosa + sphincteroanoplasty + rehabilitation treatment	10-16%	8-10,7%	-	18-26,8%
3. AI of 2-3 degrees, with cicatricial deformity of the anorectal region.	Colostomy, ASARP or PSARP + sphincteroleo plasty + rehabili tation	4-5,4%	7-10,7%	6-7,3%	17-25%
4. AI of 3 degrees, with damage to all elements of the obturator apparatus.	Colostomy, APR, ASARP or PSARP + ARP with resto ration of the puborectal loop + sphincterolevato roanoplasty with reconstruction of ana tomical defects + multiple and phased rehabilitation treatment	-	3-5,4%	6-10,7%	9-16%
Total		**30-46,1%**	**23-35,3%**	**12-18,6%**	**65-100%**

As can be seen from the table 1., thanks to the optimization of tactics, surgical and complex rehabilitation treatment method, we had good results in 30 (46.1%) patients; satisfactory - at 23 (35.3%) and unsatisfactory - at 12 (18.6%).

Thus, we were able to adjust the AI in 53 cases out of 65 patients, which is 81.4% with good and satisfactory results. The optimal criteria were: optimization of the quality of preoperative diagnostics, preparation of the patient for surgery, timely detection of concomitant abnormalities of the neighboring organs, professional competence of the surgeon, adequacy of the choice of tactics, technique of performing corrective surgery, corrective surgery.

The second group - 18 (27.6%) patients, due to congenital inferiority of the obturator apparatus of the rectum against a background of a combination of regional malformations (aplasia, agenesis of the sacrum and coccyx, hypoplasia of the muscular complex) and violation of the innervation of the pelvic organs, an AI, despite an ideally performed primary radical anorectoplasty, RRS and prolonged stage rehabilitation treatment, unsatisfactory results were preserved in the form of fecal and urinary incontinence, to varying degrees and for long periods.

In these groups of patients, prolonged ESM of anal incontinence, rectal gymnastics, training enemas using the principles of biofeedback (in children older than 5 years), the development of an individual lifestyle up to 5 years and long courses of complex neurological treatment led to a satisfactory condition of patients, only in 5 (27.7%) cases.

Thus, in the first group of patients without concomitant pathologies against the background of purulent-inflammatory complications and diagnostic, tactical and technical errors as a result of which, they led to stenosis and dystopia of the anal canal, deformation of the perineum, extinction of the mucosa of the reduced intestine, relapse of the fistula into the urinary and reproductive system, RRS was provided in children. In the distant period, against the background of complex treatment, in these categories of patients, good results were obtained in 30 (46.1%) patients; satisfactory - in 23 (35.3%) and unsatisfactory - in 12 (18.6%).

In the second group of patients, in addition to

the correction of ARM, against the background of a concomitant disturbance of the innervation of the pelvic organs due to thickening of the terminal filament and spinal cord, underdevelopment of the caudal region of the vertebrae and the arm and levator muscle structures, good results were not noted, satisfactory - in 5 (27.7 %) and unsatisfactory - in 13 (72.3%) of the 18 cases.

Results

1. Indications for missile defense are determined taking into account 2-3 degrees of AI and deformation of the anorectal region.
2. By analyzing the causes, errors and complications, optimizing preoperative diagnostics, optimizing tactics, method of surgical and comprehensive rehabilitation treatment and postoperative preventive measures, it was possible to improve the results of RRS treatment by 81.4%.
3. For the prevention of postoperative complications of ARM during repeated correction in children, it is necessary to avoid possible diagnostic, tactical and technical errors by applying optimal tactics and techniques of repeated corrective surgery and ensuring high-quality rehabilitation treatment.

Ethical Clearance: No ethical approval is needed.

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Conflict of Interest: Nil

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