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journal homepage: [www.elsevier.com/locate/jped surg](http://www.elsevier.com/locate/jped surg)Sclerotherapy for the management of rectal prolapse in children<sup>☆,☆☆</sup>

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## ABSTRACT

**Purpose:** Rectal prolapse is a commonly occurring and usually self-limited process in children. Surgical management is indicated for failures of conservative management. However, the optimal approach is unknown. The purpose of this study is to determine the efficacy of sclerotherapy for the management of rectal prolapse.

**Methods:** This was a retrospective review of children <18 years with rectal prolapse who underwent sclerotherapy, predominantly with peanut oil (91%), between 1998 and 2015. Patients with imperforate anus or cloaca abnormalities, Hirschsprung disease, or prior pull-through procedures were excluded.

**Results:** Fifty-seven patients were included with a median age of 4.9 years (interquartile range (IQR) 3.2–9.2) and median follow-up of 52 months (IQR 8–91). Twenty patients (n = 20/57; 35%) recurred at a median of 1.6 months (IQR 0.8–3.6). Only 3 patients experienced recurrence after 4 months. Nine of the patients who recurred (n = 9/20; 45%) were re-treated with sclerotherapy. This was successful in 5 patients (n = 5/9; 56%). Two patients (n = 2/20; 10%) experienced a mucosal recurrence which resolved with conservative management. Forty-four patients were thus cured with sclerotherapy alone (n = 44/57; 77%). No patients undergoing sclerotherapy had an adverse event. Thirteen patients (n = 13/20; 65%) underwent rectopexy after failing at least one treatment of sclerotherapy. Three of these patients (n = 3/13; 23%) recurred following rectopexy and required an additional operation.

**Conclusions:** Injection sclerotherapy for children with rectal prolapse resulted in a durable cure of prolapse in most children. Patients who recur following sclerotherapy tend to recur within 4 months. Another attempt at sclerotherapy following recurrence is reasonable and was successful half of the time. Sclerotherapy should be the preferred initial treatment for rectal prolapse in children and for the initial treatment of recurrence.

**Level of evidence:** Level IV.

**Type of study:** Treatment Study.

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Rectal prolapse is a relatively common condition in children that typically occurs before the year of four, around the time toilet training begins [1–4]. It is most frequently idiopathic and self-limited and resolves with improved toileting habits and stool softeners within one year in the majority of patients [1–6]. If prolapse persists despite optimal management, various strategies exist for treatment. These include injection sclerotherapy [4–17], encircling of the anus, also known as the Thiersch operation [10,18], abdominal operations [3,13,19,20], and perineal operations [10,21]. Given the varied approaches, no one technique currently predominates thereby creating a wide heterogeneity in practice patterns.

Sclerotherapy has several potential advantages including its minimally invasive nature and low complication profile [4]. We seek to determine the success of injection sclerotherapy in patients with rectal prolapse who failed conservative management in a large, tertiary academic center. We also aim to characterize factors associated with failure of sclerotherapy to determine if there are patients who may benefit from initial operative management.

### 1. Materials and methods

This is a single institution retrospective review of patients less than 18 years old who underwent injection sclerotherapy for rectal prolapse between 1998 and 2015. Patients with imperforate anus or cloaca abnormalities, Hirschsprung's disease, or prior pull-through procedures were excluded. Additionally, two patients who underwent primary rectopexy were excluded. Appropriate institutional review board approval was obtained prior to initiating the study.

Patients with rectal prolapse were treated via a standard pathway. This standard pathway included initial medical management with

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fiber supplementation in all patients. If patients had constipation, they were treated with laxatives. Behavior modification was used in all patients which included minimizing time on the toilet and avoiding. If medical management failed to resolve the prolapse in 1–3 months, patients were considered for injection sclerotherapy. The surgery was performed by multiple surgeons at a single hospital. Preoperative preparation involved decompression of the rectum with an enema or suppository with intraoperative irrigation as needed. Patients were placed in the lithotomy position under general anesthesia. A digital rectal examination was performed to rule out the presence of rectal polyps or other abnormalities. The majority of patients received 5% phenol in peanut oil as the sclerosing agent, which was compounded by the pharmacy department and then dry-heat sterilized with a batch sent to microbiology for sterility testing prior to release of the dose for patient use. Alternative sclerosant agents included 5% phenol in almond oil or concentrated dextrose solutions (25% or higher) and were utilized based on patient allergy profiles. The agent was administered via direct injection into the submucosal tissue, beginning at the dentate line and extending approximately 8 cm proximally up the rectal wall. This was performed in 4-quadrants around the rectum.

Statistical analysis was performed with SAS version 9.4 (SAS Institute Inc., Cary, NC). Continuous variables were not normally distributed; thus, median values with interquartile range (IQR) are displayed. Univariate analysis was conducted with Chi-square, Fisher's exact test, or Wilcoxon-Rank Sum tests as appropriate.

## 2. Results

Fifty-seven patients undergoing injection sclerotherapy were included for analysis. Patient demographics, operative characteristics, and postoperative results are given in Table 1. Patients were followed for a median of 52 months (IQR: 7.6–91.0 months). (See Table 2.)

Phenol in peanut oil was the predominant sclerosant used ( $n = 51/57$ ; 91%). Three patients with a peanut allergy underwent sclerotherapy with phenol in almond oil and two patients with nut allergies underwent sclerotherapy with concentrated dextrose solution. The median volume of sclerosant was 10 mL (IQR: 10–15 mL) and the median sclerosant volume per kg was 0.5 mL/kg (IQR: 0.3–0.8 mL/kg). Sclerotherapy was performed as an outpatient procedure in all cases and none of the patients undergoing sclerotherapy experienced a postoperative complication.

**Table 1**  
Preoperative, operative, and postoperative characteristics of patients undergoing injection sclerotherapy for recalcitrant rectal prolapse.

	n (%) or Median (Interquartile Range)
<i>Preoperative Characteristics:</i>	
Gender (male, n (%)):	42 (73.7%)
Age (yrs; median (IQR)):	4.9 (3.2–9.2)
Weight (kg; median (IQR)):	20.0 (15.0–34.0)
Length of Follow-up (months; median (IQR)):	51.9 (7.6–91.0)
<i>Operative Characteristics:</i>	
Sclerosant Used (n (%)) <sup>a</sup> :	
Peanut oil with phenol:	51 (91.1%)
Almond oil with phenol:	3 (5.4%)
Dextrose solution:	2 (3.6%)
Sclerosant Volume (mL; median (IQR)):	10 (10–15)
Sclerosant Volume/Weight (mL/kg; median (IQR)):	0.47 (0.33–0.77)
<i>Postoperative Complications:</i>	
Recurrence (n (%)):	20 (35.1%)
Sclerotherapy first for Recurrence (n (%)):	9 (45.0%)
Surgical Repair (n (%)):	13 (65.0%)
Resolved without surgery (n (%)):	2 (10.0%)
Length to Recurrence (months; median (IQR)):	1.6 (0.8–3.6)

<sup>a</sup> The sclerosant used was not charted in one patient.

**Table 2**

Preoperative and operative factors associated with recurrence following primary sclerotherapy.

Preoperative and Operative Factor	No Recurrence (n = 37)	Recurrence (n = 20)	p-value
Gender (male, n (%)):	29 (78.4%)	13 (65.0%)	0.27
Age (yrs; median (IQR)):	4.2 (3.0–5.9)	8.2 (4.8–13.4)	<0.01
Weight (kg; median (IQR)):	18.0 (14.5–21.5)	37.0 (23.0–53.0)	<0.01
Sclerosant Used (n (%)) <sup>a</sup> :			<0.01
Peanut oil with phenol:	36 (100.0%)	15 (75.0%)	
Almond oil with phenol:	0 (0.0)	3 (15.0%)	
Dextrose solution:	0 (0.0)	2 (10.0%)	
Volume (mL; median (IQR)):	10.0 (9.0–12.5)	12.8 (10.0–18.5)	0.02
Volume/Weight (mL/kg; median (IQR)):	0.50 (0.37–0.77)	0.38 (0.29–0.78)	0.41

<sup>a</sup> The sclerosant used was not charted in one patient.

Recurrence occurred in 20 patients ( $n = 20/57$ ; 35%) (Fig. 1). The majority of patients ( $n = 17/20$ ; 85%) experienced recurrence in the first four months after sclerotherapy. In two of the patients with recurrence ( $n = 2/20$ ; 10%), medical management of their constipation resulted in resolution of prolapse without further operative management. Nine patients ( $n = 9/20$ ; 45%) underwent repeated sclerotherapy. This was successful in five patients ( $n = 5/9$ ; 56%). Three patients were cured after 2 total rounds of sclerotherapy, one person was cured after 3 total rounds of sclerotherapy, and one person was cured after 4 total rounds of sclerotherapy, with treatment intervals from one month to several years. Thus, in total, sclerotherapy alone resulted in a durable cure of rectal prolapse in forty-four patients ( $n = 44/57$ ; 77%). Four patients who underwent repeated sclerotherapy ( $n = 4/9$ ; 44%) eventually required a rectopexy. One of these four patients required a sigmoidectomy and Hartmann pouch after failed rectopexy. Nine patients underwent rectopexy after one attempt at sclerotherapy. Two of these patients required another operation for rectal prolapse. This involved an excision of rectal procidentia with anastomosis via a perineal approach in one patient and a sigmoidectomy via abdominal approach in another patient. Thus, thirteen total patients ( $n = 13/20$ ; 65%) with recurrence following sclerotherapy underwent a rectopexy. Three of these patients ( $n = 3/13$ ; 23%) recurred and required another operative intervention.

In evaluating factors associated with recurrence, older age, higher weight, and sclerosant other than phenol in peanut oil were all significantly associated with recurrence ( $p$ -value < 0.05). All patients who used phenol in almond oil or dextrose solution experienced a recurrence. Two of the three patients with recurrence following phenol in almond oil sclerotherapy required rectopexy and the other patient was cured with repeated sclerotherapy. Both patients with recurrence after dextrose injection sclerotherapy were cured with repeated sclerotherapy. Higher sclerosant volume was associated with recurrence ( $p$ -value = 0.02). However, there was no association with sclerosant volume and recurrence after standardization patient weight ( $p$ -value = 0.41).

In evaluating factors associated with eventual success of sclerotherapy or eventual requirement of operative management, similar factors to recurrence were associated with requirement for eventual operation, but the differences in groups are larger (Table 3). Patients who required operative management were 7.9 years older on average and 28 kg heavier on average. There was a patient who was 18 years old and another who weighed 71 kg whose rectal prolapse was cured with sclerotherapy alone.

## 3. Discussion

In our single center retrospective review that spanned over 15 years, fifty-seven patients who underwent primary injection sclerotherapy for rectal prolapse were examined. This represents one of the largest series of injection sclerotherapy in the current literature. Our results demonstrate that the first sclerotherapy results in durable cure of prolapse in

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