

Efficacy of *Acacia senegal* for Stoma Care in Children with Colostomy

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Abstract

Introduction The creation of a stoma on the abdomen and the need for appliance on the peristomal skin make this region vulnerable to inflammatory skin disorders. In this study, we introduce a novel protection with *Acacia senegal* and compare the protective effects of this barrier with zinc sulfate ointment.

Methods and Materials To examine the effect of protective interventions, a prospective, controlled, clinical study was conducted. Participants were all infants consecutively admitted to the pediatric surgery unit of the study hospitals for elective surgery of colostomy creation. After laparotomy and double barrel colostomy creation, patients were randomly assigned to use one barrier (gum acacia or zinc sulfate ointment) for 4 weeks.

Results In this study, a total of 60 infants (30 as case and 30 as control) were evaluated. Results showed that there was a statistically significant difference in peristomal skin inflammation rate in groups; infants who had *Acacia senegal* barrier showed lower and less severe inflammation rates ($p = 0.05$).

Conclusion Compared with zinc oxide, we found a lower rate of dermatitis in the *Acacia* group.

Keywords

- ▶ *Acacia senegal*
- ▶ stoma care
- ▶ peristomal dermatitis

Introduction

In children, colostomy may be required as a crucial part of treatment of some congenital anomalies of the large bowel; however, this procedure is associated with significant complications.¹ The creation of a stoma on the abdomen and the need for appliance on the peristomal skin make this region vulnerable to inflammatory skin disorders.^{2,3} Despite advances in stoma care, evidence involving various types of barriers continues to highlight the lacking of standardized treatment.

In this study, we introduce a novel protection with *Acacia senegal* and compare the protective effects of this barrier with zinc sulfate ointment.

Methods and Materials

This study was performed in two pediatric surgery wards of two large hospitals in Iran from March 2009 to 2011. To examine the effect of protective interventions, a prospective, controlled, clinical study was conducted. To divide the children into groups, children with odd card numbers were allocated to the case group and those with even numbers were selected as controls. Participants were all infants consecutively admitted to the pediatric surgery unit of the study hospitals for elective surgery of colostomy creation. The inclusion criteria were Hirschsprung's enterocolitis not responded to medical therapy and infants with diagnosis of high imperforate anus.

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Infants with a medical diagnosis or a positive family history of asthma or allergic diseases were excluded because several studies have established a preliminary link between *Acacia senegal* and these disorders.^{4,5} Approval for the study was obtained from the university and hospital ethics committees. Written consent was obtained from the parents after discussion of study proposes for them.

Intervention

All patients underwent laparotomy and double barrel colostomy creation as described by Ekenze et al.⁶ In all patients, stoma was routed at sigmoid colon. Patients that had other location for ostomy creation was excluded. An intravenous antibiotic Mefoxin (cefoxitin) was given before the procedure in all the patients. Postoperative intravenous antibiotics were continued in all patients. Cefoxitin and Principen (ampicillin)/Garamycin (gentamicin) were once again the most commonly used antibiotics postoperatively. Intravenous antibiotics were continued after surgery for 24 hours. Postoperatively, patients were randomly assigned to use one barrier (gum acacia or zinc sulfate ointment) for 4 weeks. For this purpose, we used commercially *Acacia senegal* fiber pockets (Heather's Tummy Care, Inc., Seattle, WA, USA). For gum production, 2.5 g of *Acacia* fibers were soaked in 10 cc hot water for half an hour and then cooled at room temperature. Under the supervision of ostomy care nurse, the skin around the stoma was cleaned with warm water, and then, a thick layer of gelatinous gum was used to cover the peristomal skin. Then colostomy bag was centered over the stoma. We used the same bags in all children. This method was repeated twice daily for 2 weeks. In control group, 2.5% zinc sulfate ointment was used in similar pattern.

At the end of the study (1 month), peristomal skin clinically examined by a research dermatologist was unaware of participant allocation. Skin inflammation was diagnosed clinically according to Ruzicka et al study.⁷ Severity was defined according to the Physician Global Assessment (PGA). The severity of each PGA sign or symptom was described in the modified Total lesion symptom Score.⁷

A surgical site infection was defined using the Center for Disease Control and Prevention's criteria.⁸ The definition required the patient to demonstrate one of the following:

purulent wound discharge, positive wound culture from the incision site, or have the diagnosis made by the surgeon or attending physician. In addition if a patient had pain, or redness, or swelling and the incision was purposely opened by the surgeon, this was also counted as a wound infection. Patients with documented wound infection were treated based on clinical symptoms and wound culture (yeast and bacterial infections).

The statistical package for social sciences (SPSS, Chicago, IL, USA) software (version 11.5) was used for data analysis. Data were expressed as mean \pm SD for quantitative variables and percentage for qualitative ones. The Mann-Whitney test was used to determine any difference in mean scores. The Wilcoxon rank-sum test was used to compare peristomal skin inflammation severity in groups. We did power analysis in this study. Our power was 0.8 and sample size was sufficient (based on the preliminary study results).

$$n = \left(\frac{z1 - \alpha/2 \sqrt{2\bar{p}(1-\bar{p})} + (z1 - \beta) \sqrt{p1(1-p1) + p2(1-p2)}}{d} \right)^2$$

$$\bar{p} = \frac{p1 + p2}{2}$$

$$d = p1 - p2$$

$$n = \frac{(0/9 * 0/1) + (0/5 * 0/5)}{0/02^2}$$

$$z1 - \alpha/2 = 1/96 \quad \alpha = 0/05$$

$$z1 - \beta = 0/84 \quad 1 - \beta = 0/80$$

The *p* values less than 0.05 were considered significant.

Results

In this study, a total of 60 infants (30 as case and 30 as control) were evaluated. Information on the demographic and clinical diagnosis of the case and the control groups was presented in ►Table 1. The results revealed that the groups were similar with respect to age, gender, and diagnosis. The incidence of

Table 1 Comparison of Groups with Regard to Demographic and Primary Diagnosis

	Case (n [%])	Control (n [%])	<i>p</i>
Number of patients	30	30	
Gender			
Male	22	24	NS
Female	8	6	
Age (days)	5.32 \pm 1.41	4.87 \pm 2.13	NS
Diagnosis			
Hirschsprung	22	20	NS
High imperforate anus	8	10	

NS, not significant.

Table 2 Incidence of Postoperative Peristomal Skin Inflammation in Groups

Severity (n [%])	0	Mild	Moderate	Severe	Total
Case	28 (93.4)	2 (6.6)	0	0	2 (6.6%)
Control	20 (84)	5 (3)	3 (10)	2 (3)	10 (30%)

postoperative peristomal skin inflammation is shown in **Table 2**. Results showed that there was a statistically significant difference in peristomal skin inflammation rate in groups; infants who had *Acacia senegal* barrier showed lower and less severe inflammation rates ($p = 0.05$) (**Figs. 1 and 2**).

Discussion

Despite the progress in modern nursery, the choice of barrier to prevent peristomal skin inflammation is still controversially discussed.^{9,10} Petroleum and zinc oxide are the common external barriers that are occlusive to water, however, these preparations have a greasy consistency that can affect the adhesion of the appliance to skin, therefore framing the stoma by film dressing is more effective. On the other hand, film dressing makes an impermeable sheet to protect the peristomal skin against fecal materials escaped from the stoma bag.

**Figure 1** Peristomal skin inflammation in a child of control group.**Figure 2** Peristomal skin inflammation in a child of case group.

Although many skin protection products were used for irritated skin around the stoma, some of them are so expensive and not achievable in every center. In this study, we introduced *Acacia senegal* as an effective and simple achievable barrier for protection of effluent dermatitis.

Acacia senegal is a small deciduous *Acacia* tree known by the common names rfaudraksha, gum acacia, gum arabic (GA) tree, or gum senegal. It is native to semidesert regions of sub-Saharan Africa, as well as Oman, Pakistan, and India. Its dried seeds are used as food by humans. In gum form, it is used for soothing mucous membranes of intestine and to treat inflamed skin.¹¹

It is also reportedly used to treat bleeding, bronchitis, diarrhea, gonorrhea, leprosy, and upper respiratory tract infections.^{12,13} It is also used in cosmetics as an adhesive for facial masks and powders.

GA, as natural proteoglycan exudates from the stems of *Acacia senegal* is a branched-chain, complex polysaccharide, either neutral or slightly acidic, found as mixed calcium, magnesium, and potassium salt of a polysaccharidic acid. The backbone is composed of 1,3-linked b-D-galactopyranosyl units. The side chains are composed of two to five 1,3-linked b-D-galactopyranosyl units, joined to the main chain by 1,6-linkages.¹⁴ Gum is completely solved in warm water and gives a translucent, viscous (gelatinous) solution that can be used as a potent protective barrier on peristomal skin as film-forming agent. Its side effects are minimal and include allergy and asthmatic attacks. We have no side effects in our study population.

Although *Acacia senegal* fiber may not easily available in European countries, but its preventive effects are so significant that it can be suggested for suitable production to establish by the industry for specific use in stoma care in the markets.

In conclusion, our study showed the significant protective effect of *Acacia senegal* for stoma care in children.

Conflict of Interest

None

References

- Herlufsen P, Olsen AG, Carlsen B, et al. Study of peristomal skin disorders in patients with permanent stomas. *Br J Nurs* 2006;15 (16):854–862
- Ratliff CR. Early Peristomal Skin Complications Reported by WOC Nurses. *J Wound Ostomy Continence Nurs* 2010;37(5):505–510
- Nybaek H, Jemec GB. Skin problems in stoma patients. *J Eur Acad Dermatol Venereol* 2010;24(3):249–257
- Sander I, Raulf-Heimsoth M, Wiemer K, Kespohl S, Brüning T, Merget R. Sensitization due to gum arabic (*Acacia senegal*): the cause of occupational allergic asthma or crossreaction to carbohydrates? *Int Arch Allergy Immunol* 2006;141(1):51–56

- 5 Fötisch K, Fäh J, Wüthrich B, Altmann F, Hausteil D, Vieths S. IgE antibodies specific for carbohydrates in a patient allergic to gum arabic (*Acacia senegal*). *Allergy* 1998;53(11):1043–1051
- 6 Ekenze SO, Agugua-Obianyo NEN, Amah CC. Colostomy for large bowel anomalies in children: a case controlled study. *Int J Surg* 2007;5(4):273–277
- 7 Ruzicka T, Lynde CW, Jemec GB, et al. Efficacy and safety of oral alitretinoin (9-cis retinoic acid) in patients with severe chronic hand eczema refractory to topical corticosteroids: results of a randomized, double-blind, placebo-controlled, multicentre trial. *Br J Dermatol* 2008;158(4):808–817
- 8 Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. *Am J Infect Control* 2008;36(5):309–332
- 9 Kevin Y, Woo RN. Peristomal skin complications and management. *The Journal for Prevention and Healing* 2009;22:522–532
- 10 Burt-McAliley D, Eberhardt D, van Rijswijk L. Clinical study: peristomal skin irritation in colostomy patients. *Ostomy Wound Manage* 1994;40(6):28–30, 32–34, 36–37
- 11 Ali BH, Ziada A, Blunden G. Biological effects of gum arabic: a review of some recent research. *Food Chem Toxicol* 2009;47(1):1–8
- 12 Nasir O, Wang K, Föller M, et al. Downregulation of angiogenin transcript levels and inhibition of colonic carcinoma by gum arabic (*Acacia senegal*). *Nutr Cancer* 2010;62(6):802–810
- 13 Al-Yahya AA, Al-Majed AA, Gado AM, Daba MH, Al-Shabanah OA, Abd-Allah AR. *Acacia Senegal* gum exudate offers protection against cyclophosphamide-induced urinary bladder cytotoxicity. *Oxid Med Cell Longev* 2009;2(4):207–213
- 14 Mahendran T, Williams PA, Phillips GO, Al-Assaf S, Baldwin TC. New insights into the structural characteristics of the arabinogalactan-protein (AGP) fraction of gum arabic. *J Agric Food Chem* 2008;56(19):9269–9276