

Starch-based Hemostatic Powder as a Novel Anti-adhesive Agent

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Abstract

Introduction: Adhesions develop after up to 97% of abdominal surgery causing chronic pain and intestinal obstruction. Only a few of hemostatic agents are available for adhesion prevention [2-4]. In this retrospective study we investigated the effectivity of starch based hemostatic powder (SBHP) on preventing postoperative intraabdominal adhesions.

Patients and Methods: This retrospective study comprises 54 patients aged 18-67, who underwent second look laparotomy/laparoscopy in the period from 2018 and 2021. Only patients with a second look surgery were included in the study. Group-1 had been applied hemostatic agent in initial operation as Group-2 had not been applied any agents. On second-look laparotomy adhesions has observed and recorded.

Results: Both median adhesion severity and extent scores in Group-1 were 0.4, and 1.8 in Group-2. The statistical evaluation shows that both severity and extent were significantly reduced from Group-2 to Group-1 when SBHP was used.

Conclusion: In the light of the high efficacy observed in the present study we recommend to take SBHP into consideration as anti-adhesive agent additional to hemostatic product.

Keywords: Adhesion; Surgery; Anti-adhesive

Introduction

Adhesions develop after up to 97% of abdominal surgery causing chronic pain and intestinal obstruction. Several methods to prevent adhesions have been argued but mostly either have low effectivity or are not suitable in resective intestinal surgery or insufficient hemostasis [1]. It is a significant issue which lead patient morbidity, cause subsequent surgeries technical demanding and incline costs to national health care system. Only a few of

hemostatic agents are available for adhesion prevention [2-4]. In this retrospective study we investigated the effectivity of starch based hemostatic powder (SBHP) on preventing postoperative intraabdominal adhesions.

Patients and Methods

This retrospective study comprises 54 patients aged 18-67, who underwent second look laparotomy/laparoscopy in the period

from 2018 and 2021. Adhesions had been caused by surgeries for various pre-existing conditions such as trauma or other operations for surgical emergencies like appendectomies, cholecystectomies, colectomies and others. Only patients with a second look surgery were included in the study. Extent and severity of adhesions were scored during both interventions enabling a direct assessment of the efficacy of the adhesion prevention device. The first 21 consecutive patients had received SBHP (Arista™, Bard, USA/Oxigel Powder, Betatech Med, Istanbul, Turkey) on initial operation due to bleeding (Group-1), whereas the following 33 were treated without SBHP (Group-2). The product was either applied as a powder or subsequently dripped with saline solution in situ premixed extracorporeally. SBHP was distributed on all surgically affected surfaces in the peritoneal cavity and the lesser pelvis.

Furthermore, patient data like gender, age, Body Mass Index BMI were also collected.

Therefore, an adhesion score had used, modified from the one by Corson, *et al.* (1995). Adhesion severity was scored on a five point scale ranging from 0 to 2 (0 1/4 no adhesions, 1 1/4 filmy, avascular adhesions, 2 1/4 organised, cohesive, vascular, dense adhesions).

Results

Of 54 patients median age was 33+/- 4 years and no statistically significant difference between groups. 38 male and 16 female patients has evaluated and there was no statistically significant difference. Median BMI was 24.4 and there was no difference between groups.

All 54 patients underwent second look laparoscopy/laparotomy in postoperative 2 months for hemorrhagia, infection/abscess/anastomotic leakage, bile duct injury, iatrogenic injury of intestines and collection after an initial operation for ; trauma surgery (38 patients), appendectomy (3 patients), cholecystectomy (1 patient), organ perforation repair/resection (7 patients), tumor perforation/obstruction surgery (5 patients).

Both median adhesion severity and extent scores in Group-1 were 0.4, and 1.8 in Group-2. The statistical assessment suggested that both severity and extent were significantly reduced from Group-2 to Group-1 when SBHP was used.

Adhesion classification per groups as follows; in Group-1; overall adhesion occurrence 13(61%); 0 points for 8 patients (38%), 1 points for 4 patients (19%), 2 points for 1 patient (4.7%). Whereas in Group-2; overall adhesion occurrence 24(72%); 0 points for 4 patients (12.12%), 1 points for 12 patients (36.6%), 2 points for 8 patient (24%) $p < 0.05$.

Discussion and Conclusion

Adhesions are abnormal fibrous structures in the abdominal cavity, mostly occurring after surgery [1]. They develop in up to 97% of patients after abdominal surgery and may lead chronic abdominal and pelvic pain, secondary female infertility, intestinal obstruction, reoperations with serious complications, in addition to great costs for the health care system [5,6]. Intestinal obstruction is main and serious complication with a mortality rate of up to 15% after adhesive obstruction [7].

There are usually four strategies to minimise adhesion occurrence: delicate surgical techniques, pharmaceutical agents, as well as application of liquid solutions and solid barriers [8,9]. The modification of the surgical technique intend to lead the minimum possible trauma or avoiding postoperative contact of injured tissues [8,10]. In any case, the extensive utilisation of minimally invasive techniques has neither minimize complications nor costs effectively, on contrary it make it difficult to use solid materials as anti-adhesive agents [8,10].

In previous years, the optimal results for the only type of adhesion barrier had been succeeded with cellulose based products. A latest article evaluated their usage for the minimisation of de novo adhesions after laparoscopic surgery in randomised controlled trials. The pooled results of these suggest a significant adhesion reduction by 37% as the agent application protract the operation by four minutes [8-11].

This study has designed to assess the anti adhesive effect of starch based powder as a well known hemostatic agent already by evaluating the patients who required second look laparotomies showed an efficiency up to %75. SBHP is a novel product applied for both hemostasis and adhesion prevention [12-14]. It is purely plantbased and comprise of polysaccharide particles which have a high capability to absorb water. This enables a twofold effect by absorbing water from wound blood leads to concentration

of coagulation factors and blood cells, which boosts the clotting enabling hemostasis and significantly effective as a barrier against adhesion formation [12-14]. As for safety Zigler and friend proved that this product can be accepted safe and does not stimulate inflammatory cascade of further clinical significance [15].

As no side effects or complications were observed, the use of SBHP is admissible safe. In addition, no remnants of the agent were reported during the second look laparotomy. Therefore, the combination of SBHP powder for haemostasis and anti-adhesive product is acceptable. In the light of the high efficacy observed in the present study we recommend to take SBHP into consideration as anti-adhesive agent additional to hemostatic product. Although the results of this study suggests a significant anti-adhesive efficacy of the product, large scaled prospective-randomised studies needed.

Bibliography

- Blumhardt G., *et al.* "Effect of 4DryField® PH, a Novel Adhesion Barrier, on Recurrence of Intestinal Adhesions after Extensive Visceral Adhesiolysis". *Case Reports in Surgery* (2018): 9628742.
- Watrowski R. "Unifying local hemostasis and adhesion prevention during gynecologic laparoscopies: experiences with a novel, plant based agent". *Journal of Obstetrics and Gynaecology* 40.4 (2020): 586-588.
- Pöhnert D., *et al.* "Comparison of adhesion prevention efficacy of coated Parietex and Proceed meshes versus uncoated polypropylene mesh combined with anti-adhesion device 4DryField PH in a new IPOM rat model with impaired intestinal peritoneum". *Zeitschrift für Gastroenterologie* 54 (2016): 131.
- Pöhnert D., *et al.* "Evaluation of the effectiveness of adhesion prevention devices in a rat model". *Zeitschrift für Gastroenterologie* 54 (2016): 132.
- MA Weibel and G Majno. "Peritoneal adhesions and their relation to abdominal surgery: a postmortem study". *American Journal of Surgery* 126.3 (1973): 345-353.
- MP Diamond and ML Freeman. "Clinical implications of postsurgical adhesions". *Human Reproduction Update* 7.6 (2001): 567-576.
- K H Treutner., *et al.* "Causes of intestinal obstruction—a retrospective study of 550 surgical cases". in *Peritoneal Adhesions*, K.-H. Treutner and V. Schumpelick, Eds., pp. 191-194, Springer, Berlin, Germany, (1997).
- Ziegler N and De Wilde RL. "Reduction of adhesion formation after gynaecological adhesiolysis surgery with 4DryField PH - a retrospective, controlled study with second look laparoscopies". *Journal of Obstetrics and Gynaecology* 42.4 (2022): 658-664.
- Korell M., *et al.* "Use of modified polysaccharide 4DryFieldVR PH for adhesion prevention and hemostasis in gynecological surgery: a two-center observational study by second-look laparoscopy". *BioMed Research International* (2016): 1-9.
- Kavic SM., *et al.* "Adhesions and adhesiolysis: the role of laparoscopy". *JSLs: Journal of the Society of Laparoendoscopic Surgeons* 6 (2002): 99-109.
- Raimondo D., *et al.* "Cellulose absorbable barrier for prevention of de-novo adhesion formation at the time of laparoscopic myomectomy: a systematic review and meta-analysis of randomized controlled trials". *European Journal of Obstetrics and Gynecology and Reproductive Biology* 245 (2020): 107-113.
- Korell M. "Combined hemostasis and adhesion prevention with the novel agent 4DryFieldVR PH—initial observations". *Surgical Science* 5 (2014): 533-539.
- Hanke AA., *et al.* "Effects of a New Microporous Polysaccharide Powder on Viscoelastic Characteristics of Clot Formation. American Society of Anesthesiologists Annual Meeting 2011". *Anesthesiology* (2011).
- Poehnert D., *et al.* "Marked Reduction of Peritoneal Adhesion Formation in Rat Model of Cecal Abrasion by a Novel Anti-Adhesive Agent, 4DryField® PH: 131st Congress of the German Society for Surgery". *Langenbeck's Archives of Surgery* 399 (2014): 371-413.
- Ziegler N., *et al.* "Changed inflammatory markers after application of 4DryField PH for adhesion prevention in gynecological surgery". *Archives of Gynecology and Obstetrics* 304.4 (2021): 951-955.