

The effect of hyaluronic acid gel on preventing post-surgical adhesions after laparoscopic surgery

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Intraperitoneal adhesions are an important cause of postoperative intestinal obstruction, abdominal discomfort, and infertility. Despite careful attention to minimize tissue trauma and ensure hemostasis, pelvic surgery is associated with both de novo adhesion formation and reformation. In this study our aim is to investigate the efficacy of hyaluronic acid gel on preventing/healing postoperative adhesions. 124 women on reproductive age who underwent emergency laparoscopic surgery (appendicitis, gynecologic emergencies, trauma, hernias) included in this retrospective study. 28 of these patients underwent second-look surgery in 14-30 days. 17 of patients were applied hyaluronic acid gel on the initial surgery (Group-1) and 11 of patients were not applied (Group-2). There were no significant differences between the two groups for age and weight. The operating time was similar in the two groups. At follow-up, a significantly ($p < 0.01$) lower rate of postsurgical adhesions was observed in Group-1 in comparison with Group-2. The median rate of adhesions was significantly ($p < 0.05$) lower in patients treated with hyaluronic acid in respect to the group who treated surgery alone. This study showed that hyaluronic acid treatment after laparoscopy/laparotomy is a significantly effective and very cost-effective option for prevention and treatment of postoperative adhesions. We believe it is very important of usage hyaluronic acid especially on reproductive age women population in order to prevent the worsening effect of postsurgical adhesion on fertility.

Keywords:laparoscopy,laparotomy,post-surgical-adhesion,anti-adhesive,hyaluronicacid

Introduction

Intraperitoneal adhesions are an important cause of postoperative intestinal obstruction, abdominal discomfort, and infertility [1]. Despite careful attention to minimize tissue trauma and ensure hemostasis, pelvic surgery is associated with both de novo adhesion formation and reformation. Adhesions occur after approximately 80% of gynecological surgical procedures, and reformation after surgical lysis occurs postoperatively in 85% of patients [1]-[4]. In this study we investigated the efficacy of hyaluronic acid on preventing post-operative adhesions.

Patients and Methods

124 women on reproductive age who underwent emergency laparoscopic surgery (appendicitis, gynecologic emergencies, trauma, hernias) included in this retrospective study. 28 of these patients underwent second-look surgery in 14-30

days. 17 of patients were applied hyaluronic acid gel (Betamix Adhesion Barrier Gel®, Betatech Medical, İstanbul/Turkey) on the initial surgery (Group-1) and 11 of patients were not applied (Group-2).

Application of study device in the gel group, a 1–2 mm thick layer of gel was applied to coat all operational area from trocar site. No additional adhesion treatment was applied following

the conclusion of the surgical procedure. On Group-2 no adhesion preventing material was used.

For postoperative safety assessment the following evaluations were performed on the day of surgery and one day after surgery: physical examination, vital signs, adverse experience recording, blood count, serum chemistries and coagulation test were repeated before second-look laparoscopy. Complications and duration of the hospital stay after surgery were recorded for each patient. 2 patients

from Group-1 and 3 patients from Group-2 developed surgical site infection. No other early surgical complication developed.

A second-look surgery was performed at 2–4 weeks after initial surgery for persistent abdominal pain. At the very beginning of laparoscopy/lapatomy, each of these sites, adhesions were given the following scores:

- 0, no adhesion
- 1, filmy and avascular
- 2, dense and/or vascular
- 3, cohesive.

Scores from all potential adhesion sites were averaged to yield a total adhesion score. The number of patients with adhesions at second-look observed in the gel group was compared with those observed in controls receiving surgery alone.

Statistical significance of between-group comparisons was assessed by a χ^2 test for proportions. The Student's t-test for unpaired data was used for comparison between groups when appropriate. The operating time was compared using the Wilcoxon rank-sum test. In all analyses, statistical significance was assessed at the 5% level.

Results

The 28 patients included in the study were aged 18–44 years, with a weight range of 49–108.5 kg.

There were no significant differences between the two groups for age and weight. The operating time was similar in the two groups. At follow-up, a significantly ($p < 0.01$) lower rate of postsurgical adhesions was observed in Group-1 (3 out of 17 women) in comparison with Group-2 (9 out of 11 women) (17.6% vs. 81.8%). The median rate of adhesions was significantly ($p < 0.05$) lower in patients treated with hyaluronic acid in respect to the group who treated surgery alone.

No complications or side effects were reported after the first laparoscopy or after second-look surgery related with hyaluronic acid.

Discussion

Post-surgical adhesions are abnormal fibrous connections developing between the peritoneum and organs [5]. In abdominal and pelvic surgery, adhesion formation must be regarded as the most common post-surgical complication occurring after 60–90% of procedures [6]. The consequences are chronic pelvic pain, bowel obstruction and infertility due to formation of adnexal adhesions and complications during surgery such as difficult dissection and visceral injury [7],[8]. Adhesion

formation is a complex process influenced by various factors. Following peritoneal trauma, fibrin deposition occurs. When balance between fibrin deposition and fibrinolysis is impaired, fibrin strands occur and stable adhesions are subsequently formed [7].

Several alternative strategies have been proposed with the aim of reducing the incidence of postoperative adhesions. Pharmacological agents, including steroids, antihistamines and heparin, have been used without any clearly demonstrated advantage [9]. The first effective commercially available adhesion-prevention barriers were membranes such as Interceed (Gynecare, Somerville, NJ, USA) or Seprafilm (Genzyme, Cambridge, MA, USA), but however, these are problematic to use via laparoscopy [10]. More recently, the efficacies of an icodextrin solution, a sprayable gel system, and a viscoelastic gel have been investigated as instillates, and gels are easier to deliver during laparoscopic surgery [10],[11].

Betamix Adhesion Barrier Gel® is a sterile, transparent, and highly viscous gel that forms a barrier we investigate to prevent or reduce postsurgical adhesions [12]. A recent randomized controlled trial (RCT) examining if the intrauterine instillation of Hyaluronic acid after the evacuation of products of conception showed a significant reduction in the formation of even intrauterine adhesions postoperatively at second-look laparotomy/laparoscopy [12], [13]. The gel is composed of highly purified, auto-crosslinked polymers of hyaluronic acid. Hyaluronic acid is a main component of the connective tissue in the human body. When applied between tissue surfaces, it ensures that adhesive surfaces of the peritoneum in the ovarian fossae are separated and thus is theoretically effective in periovarian postoperative adhesion prevention. Within the peritoneum, this gel-based product is required to be placed on and adjacent to the ovaries and Fallopian tubes, and the immediate impact on ovulatory function and subsequent reproductive outcome is unclear [10]-[13].

This study showed that hyaluronic acid treatment after laparoscopy/laparotomy is a significantly effective and very cost-effective option for prevention and treatment of postoperative adhesions. We believe it is very important of usage hyaluronic acid especially on reproductive age women population in order to prevent the worsening effect of postsurgical adhesion on fertility.

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