New Adhesion Prevention Concept in Gynecological Surgery

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ABSTRACT

Postsurgical adhesion formation is a common but significant problem. This is the first clinical evaluation of a new barrier material designed to reduce or eliminate postsurgical adhesions. SprayGel™ can be delivered laparoscopically or via laparotomy to form a strongly adherent hydrogel film. In this multicenter study, we evaluated the safety and effectiveness of SprayGel absorbable adhesion barrier system in patients undergoing open or laparoscopic myomectomy procedures. Here, we discuss the results of our evaluation conducted at the University of Kiel and Polyclinic of Bordeaux, and assess some of the features of this novel adjunct to prevent formation of postsurgical adhesions.

Key Words: SprayGel, Laparoscopy, Adhesion prevention, Myomectomy.

INTRODUCTION

Adhesions are a major cause of chronic or recurrent pelvic pain in a significant population of women and are considered a major cause of infertility. It has been estimated that as many as 50% to 90% of women who have pelvic surgery for fertility enhancement will form postsurgical adhesions. Because of the magnitude of the problem, many approaches have been tested to prevent or diminish adhesion formation, but attempts have produced unequivocal results, and most recently, some products that are particularly difficult to use, especially in laparoscopic surgery.

SprayGel is an easy to apply, tissue adherent, synthetic gel barrier that is absorbable and biocompatible. The barrier is formulated to remain adherent to the site of application for 5 to 7 days, then absorb completely via hydrolysis.

The purpose of this study was to compare the effectiveness and safety of SprayGel plus a good surgical technique (treatment group) with that of a good surgical technique alone (control group) in the prevention of postsurgical adhesions after uterine myomectomy.

MATERIALS AND METHODS

This study was conducted in accordance with the ICH Harmonised Tripartite Guideline for Good Clinical Practice, EN 540, ISO 14155, European Directive 95/46/EC, and all reviewing ethics committees. All potentially eligible women scheduled to undergo conservative surgery for leiomyoma or leiomyomatous uteri giving written informed consent to participate in the study were examined within 30 days prior to surgery, including blood chemistries, hematological and coagulation parameters, and urinalysis.

At the time of the myomectomy procedure, the number, severity, area and location (anterior, posterior, or fundus) of adhesions were recorded during the original procedure, along with location, size, and number of myomas removed, and number and length of each uterine incision. Uterine incisions were closed in layers if subserosal, in 1 layer if superficial or pedunculated, with synthet-
ic absorbable suture material, maximum size 3-0, and suture tails trimmed. The surgeon was blinded to the treatment assignment during the myomectomy procedure. Upon completion of the myomectomy, but before final closing, each patient was intraoperatively reassessed to confirm continued eligibility for enrollment into the study (ie, no other adhesion prevention products used, no use of nonabsorbable sutures, no accidental enterotomy, no exposure to fluids other than Ringer’s lactate or saline, etc). At that point, patients were randomly assigned in a 1:1 ratio (treated:control) at each clinical site, by opening sealed envelopes prepared prior to the start of the study. For patients randomized to the treatment group, the surgeon coated all suture lines and potentially adhesiogenic surfaces on the uterus and adjacent structures with SprayGel. Thickness of the gel was approximately 0.5 mm to 1.0 mm.

All patients were examined at discharge and at an in-office visit 3 to 16 weeks after surgery immediately prior to a second-look laparoscopic procedure (SLL). Patients were contacted by phone 1 week after initial surgery to evaluate their general health and occurrence of any adverse events. The number, severity, and total area of adhesions were recorded again during SLL performed 3 to 16 weeks after the myomectomy, prior to any adhesiolysis.

**RESULTS**

Fifty-one patients were enrolled in the study at the time of this interim analysis. Five patients were not randomized: 2 served as training (initial) treatment patients, and 3 did not meet inclusion/exclusion criteria. One patient was not included in analyses due to incomplete documentation. Of the remaining 45 patients, 24 were randomized to treatment (T), and 21 were randomized to untreated control (C). Eighteen of the 24 T patients returned for SLL, and 13 C patients returned for SLL, at the time of this interim analysis.

Treatment and control groups were similar (Table 1). Most patients in this study had their procedure performed laparoscopically (75% T, 76% C). No statistically significant differences were observed between the 2 groups with regard to leiomyoma removed or uterine incisions. At the time of the initial procedure, patients randomized to the treatment group had a higher incidence of pre-existing adhesions (189% difference, ie, the treatment group had 1.89 times the incidence that the control group exhibited), severity (22% difference), and area (162% difference), than patients randomized to the control group.

Spray application of the adhesion barrier was straightforward, with minimal training required. Methylene blue in the barrier simplified application and confirmed that target tissues were adequately coated. The product adhered well to tissue allowing aggressive irrigation without dislodging the barrier. Drains were used in a majority of patients at 1 center (Kiel), which would have precluded the use of regional instillates.

Although not all patients who had been enrolled at initial surgery returned for SLL (71% T, 52% C), no statistically significant differences were found between the patients who did return and those who did not with respect to surgery type, primary reason for surgery, length of surgery, discharge exam, or 1-week clinic visit.

Primary efficacy outcomes were incidence (total number of adhesions), severity (mean tenacity scores), and extent (total area, cm²) of uterine adhesions seen during the SLL. Despite the fact that treatment patients began with a higher incidence of pre-existing adhesions, severity and area, at SLL, they were 3.5 times more likely to be adhesion-free: five of 18 treatment patients were adhesion-free (28%), compared with 1 of 13 (8%) in the control group (Figure 1). The total number of adhesions was 27% less in the treatment group (P=NS), and mean adhesion tenacity scores were significantly lower for the treatment group (47% less, P=0.003). No evidence was pres-

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**Table 1.**

|                  | Treated | Control |
|------------------|---------|---------|
| Randomized       | 24      | 21      |
| Mean age         | 34.5    | 35.8    |
| Mean weight, kg  | 65.1    | 62.7    |
| Prior myomectomy | 5(21%)  | 1(5%)   |
| Primary cause    |         |         |
| Infertility      | 10(42%) | 8(38%)  |
| Pain             | 7(29%)  | 8(38%)  |
| Other            | 7(29%)  | 5(24%)  |
| Leiomyoma removed|        |         |
| Mean number      | 3.1     | 2.9     |
| Mean weight, g   | 124.5   | 112.1   |
| Uterine incisions|         |         |
| Mean number      | 2.0     | 1.7     |
| Mean length, cm  | 7.8     | 7.3     |
| Completed SLL*   | 18      | 13      |

*SLL=second-look laparoscopy*
ent of residual polymer, supporting the manufacturer’s claim of complete barrier absorption.

When comparing SLL values with those of initial myomectomy surgery, using initial measurements to correct for baseline values, treated patients showed a decrease in severity ($P=0.0015$), and a trend toward a decrease in total area ($P=NS$) as shown in Figures 2 and 3. No adverse events were related to the use of the SprayGel.

**CONCLUSIONS**

SprayGel adhesion barrier was easy for the surgeon to apply, adhering strongly to a variety of angled surfaces, even in laparoscopic procedures. We found that the material circumvented many of the problems associated with earlier attempts to prevent adhesions, and although this analysis focuses on a small population, the results are very promising. This adhesion barrier system warrants further assessment in expanded populations of patients undergoing pelvic procedures.

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