EXPERIMENTAL STUDY

Effects of *Rosmarinus officinalis* extract on wound healing, colon anastomosis, and postoperative adhesion in colon anastomosis rats

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ABSTRACT

BACKGROUND: Intra-abdominal adhesions increase the incidence and duration of surgical complications. Numerous anti-adhesive agents have been utilized to address this issue, yet no definitive solution has been identified. Research on the prevention and reduction of anastomotic leakage remains a critical focus. This study aimed to evaluate the effects of *Rosmarinus officinalis* extract on colon anastomosis as a surgical model, its anti-adhesive properties, and its impact on wound healing at the laparotomy site to facilitate its clinical application.

METHODS: Fourteen rats were divided into two groups of seven. Group C (Control): Laparotomy with colon anastomosis and administration of 2 mL isotonic solution. Group R (*Rosmarinus officinalis*): Laparotomy with colon anastomosis and administration of 2 mL of 2% *Rosmarinus officinalis* extract. Macroscopic adhesion scoring was conducted and recorded. Wound tensile strength was assessed using tissue samples from the incision site. Histopathological analysis and hydroxyproline level measurements were performed on tissue samples from the incision line. Anastomotic burst pressure was measured at the colon anastomosis site.

RESULTS: No statistically significant difference in macroscopic adhesion scores was observed between the Group C and Group R (p=1.000). The mean wound tensile strength in the Group R was significantly lower than in the Group C (p=0.003). There was no statistically significant difference in mean anastomotic burst pressure between the groups (p=0.078).

CONCLUSION: Based on our findings, the peritoneal administration of *Rosmarinus officinalis* extract in the early postoperative period may increase the risk of evisceration at the abdominal incision site.

Keywords: Colon; anastomosis; Rosmarinus; postoperative; adhesion; wound healing.

INTRODUCTION

Peritoneal adhesions are considered a major complication following abdominal surgery. Inflammation, hypoxia, coagulation, and fibrinolysis are identified as the primary mechanisms underlying adhesion formation. Recurrent abdominal adhesions after abdominal surgery represent a significant health concern.[1,2] Numerous anti-adhesive agents have been employed

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to prevent postoperative adhesions, but no definitive treatment has been established.[1] Additionally, anastomotic leakage, which frequently occurs in colon surgeries performed in surgical clinics, increases morbidity and mortality. Despite advancements in perioperative care and surgical techniques, the incidence of anastomotic leaks remains unacceptably high.[3] Consequently, efforts to prevent and reduce anastomotic leakage remain a focal point of research.

Rosmarinus officinalis, commonly known as rosemary, is a member of the Lamiaceae family and has been extensively used for culinary, cosmetic, and pharmaceutical purposes for years.[4] Studies in the literature highlight the plant's diverse properties, including anti-adhesive, anti-inflammatory, skin wound-healing/skin flap viability-enhancing, antimicrobial, antithrombotic, antioxidant, hair growth-promoting, ultraviolet (UV) protective, and melanoma protective effects.[1,5-11] However, due to the small number of studies investigating its anti-adhesive properties, the predominance of studies focusing on its effects on wound healing through topical application, and the absence of research on its effects on colonic anastomosis, it was hypothesized that the systemic use of *Rosmarinus officinalis* (RO) could contribute to clinical practice by elucidating its effects on colonic anastomosis, postoperative adhesion, and skin wound healing.

The primary aim of this study was to evaluate the effects of RO extract on colonic anastomosis. The secondary aim was to assess its effects on postoperative adhesion formation and wound healing. This study was designed to investigate the impact of RO extract on colon anastomosis, its anti-adhesive properties, and its influence on wound healing in the laparotomy region, with the goal of facilitating its clinical application.

MATERIALS AND METHODS

Patient Selection and Ethical Statement

This study was conducted in the University of Health Sciences Hamidiye Animal Experiments Laboratory with the approval of the Hamidiye Animal Experiments Local Ethics Committee (Approval date/number: 13.10.2021/02-01). A total of 14 male Sprague Dawley rats, aged 16 to 20 weeks and weighing an average of 230±20 grams, were used in this investigation. Throughout the trial, all rats were maintained under standard laboratory conditions, including a controlled room temperature of 21±2°C, humidity levels of 40–60%, and a 12-hour light/dark cycle. Each rat was housed individually in a metal cage, and provided with a standard diet and access to drinking water. Regular cage maintenance and daily monitoring were performed. During the investigation, all rats were treated humanely in accordance with the Guide for the Care and Use of Experimental Animals. All surgical procedures were performed under anesthesia. Anesthetic induction involved the intraperitoneal (IP) administration of 80 mg/kg ketamine hydrochloride (Ketalar® Vial, 50 mg/mL, Eczacibasi, Istanbul, Türkiye) and 10 mg/kg intraperitoneal xylazine hydrochloride (ROMPUN® Vial, 23.32 mg/mL, Bayer). The rats were divided into two groups, with seven rats in each group:

Group C (Control): Laparotomy + colon anastomosis + 2 mL isotonic solution.

Group R (*Rosmarinus officinalis***):** Laparotomy + colon anastomosis + 2 mL of 2% *Rosmarinus officinalis* extract.

After eight hours of fasting, all rats were weighed under anesthesia. A 26-gauge angiocath was inserted into the tail vein of each rat under general anesthesia. Thirty minutes before laparotomy, 30 mg/kg/mL of cefazolin sodium and 7.5 mg/kg/mL of metronidazole were administered prophylactically. The abdominal areas of all rats were shaved, and the surgical field was disinfected with povidone-iodine in an operating room environment. A 3 cm full-thickness abdominal incision was made. The colon was completely transected at the level of the transverse colon, and a single-layer, continuous colon anastomosis was performed using 5/0 round Vicryl sutures. In the control group, 2 mL of isotonic solution was administered intraperitoneally, while the *Rosmarinus officinalis* (RO) group received 2 mL of 2% *Rosmarinus officinalis* extract. The midline abdominal incision was closed using 4/0 silk sutures. Eight hours postoperatively, the rats were fed standard rat food. Analgesia was provided by adding 20 mg/kg of paracetamol to the daily drinking water for all groups. Wound care was performed daily. On the postoperative eighth day, under anesthesia, a U-shaped incision was made, including the anterior abdominal wall and extending 2 cm to the right and left of the midline incision. A macroscopic adhesion score was recorded. The central one-third of the incision line, along with 2 cm of tissue on both the right and left sides, was excised and stored in EMEDORF tubes at -80°C for wound voltage strength measurement. The upper and lower thirds of the incision line were separately sampled for histopathological evaluation and tissue hydroxyproline analysis. Samples for histopathological evaluation were preserved in formaldehyde until processing, while tissue hydroxyproline samples were stored at -80°C in EMEDORF tubes until analysis. The peritoneal adhesion site was also sampled for microscopic adhesion scoring. The colon segment, including 2-3 cm proximal and 2-3 cm distal to the anastomosis site, was excised. Fresh anastomotic burst pressure was measured using the method described by Li et al.[12] The anastomosis line was then sampled, including 0.5 cm proximal and 0.5 cm distal portion. Half of the tissue sample was preserved in formaldehyde for histopathological examination, while the other half was stored in Eppendorf tubes at -80°C for the measurement of tissue hydroxyproline levels. After tissue sample collection, each rat was euthanized via intracardiac puncture.

Macroscopic Adhesion Scoring: Adhesions were scored as follows:

− No adhesion: 0 points,

- Single band: 1 point,
- Two bands: 2 points,
- Multiple bands: 3 points,
- Direct visceral adhesion: 4 points.[1]

Histopathological Examination: Tissue samples collected from the anastomotic site, skin incision line, and adhesion sites were embedded in paraffin blocks following routine tissue processing protocols. Sections 4-5 microns thick were stained with hematoxylin and eosin and examined under a light microscope.

Microscopic Examination:
1. Inflammatory cells in the anastomosis region (polymorphonuclear leukocytes [PMN], lymphocytes, and plasma cells) were semi-quantitatively graded as -, +, ++, or +++ based on the presence of neovascularization and collagen fiber density.

2. The degree of wound healing at the anastomotic site was graded on a scale from 1 to 5 as follows:

- Score 1: Only fibrin-purulent exudate is present.
- Score 2: Granulation tissue development in less than 25%.
- Score 3: Granulation tissue development in 25-75%.
- Score 4: Granulation tissue development in more than 50% and collagen fibers in less than 25%.
- Score 5: Collagen fibers in more than 25%.[13]

Biochemical Method: Rat wound and colon tissues were stored in dry tubes at -80 °C until biochemical analysis. The tissues were homogenized with a 1:9 (v/v) ratio of 1x phosphate-buffered saline (1x PBS, 0.1 mol/L, pH 7.4) using a ceramic ball homogenizer (QIAGEN TissueLyser LT, Hilden, Germany). The supernatants were separated by centrifugation at 10,000 × g for 10 minutes at 4 °C (Beckman Coulter Allegra® X-30, IN, USA). Protein concentrations in the separated supernatants were determined at 595 nm using a commercial kit (Coomassie Plus, Protein Assay, Thermo Fisher Scientific, Massachusetts, USA) based on the Bradford method.[14]

Anastomotic Bursting Pressure (ABP) Measurement: The colon segment, including 2-3 cm proximal and 2-3 cm distal to the anastomosis, was excised. Anastomotic burst pressure was measured following the method described by Li et al.[12] An 18 G catheter was inserted intraluminally at one end of the colon segment, ensuring the anastomosis line was in the middle, and the catheter was secured with a suture. The other end of the colon segment was sealed with a clamp. The colon segment was submerged in a plastic container filled with isotonic solution. An isotonic-methylene blue mixture was infused through the catheter at a rate of 2 mL/min using a pressurized infusion pump. Intraluminal pressure was continuously monitored using a manometry device connected to the 18 G catheter. The ABP was recorded at the moment of a sudden pressure drop or methylene blue leakage into the plastic container.

Wound Tension Strength (WTS) Measurement: An axial tensile testing system (Instron 3382 test frame) was used to measure wound tensile strength. During testing, samples were subjected to controlled tension or compression until rupture occurred. The system included electronic sensors connected to a data acquisition device (computer) and software for recording and analyzing data. The system was equipped to measure time, force, and strain using a computerized interface. Tissue samples were tested at a strain rate of 10-3 s-1. As a result of testing the tension in the tissue samples, the force at the point of tearing or rupture was measured. Two to three tests were conducted on each sample to ensure the reproducibility of the results. The outcomes were reported in Newtons (N).[15]

Preparation of *Rosmarinus officinalis* **Extract:** The preparation of *Rosmarinus officinalis* extract followed the method described by Roohbakhsh et al.[1] The maceration technique was employed. Above-ground parts of RO were obtained from the Yalova Atatürk Horticultural Center. The aerial portions of the plant were shade-dried and powdered. A total of 150 g of the powdered plant material was extracted at room temperature using a 70% hydroethanolic solution, with a solvent-to-plant ratio of 1:10. The solution was filtered and concentrated under reduced pressure at 38-40°C using a rotary evaporator. The resulting extract was dried thoroughly with a lyophilizer to produce a powdered form. A 2% solution of the RO extract was prepared using an isotonic solution and a total of 2 mL of this solution was administered intraperitoneally to each rat.

Statistical Analysis

Continuous variables were summarized using descriptive statistics. For parameters that did not follow a normal distribution, median (minimum-maximum) values were reported, while mean ± standard deviation values were provided for parameters that conformed to a normal distribution. The Shapiro-Wilks test was used to assess the conformity of continuous variables to the normal distribution. The Mann-Whitney U test was applied to evaluate the relationship between two non-normally distributed continuous variables. The Chi-Square test (or Fisher's Exact Test/Yates' Continuity Correction, as appropriate) was used to analyze associations between categorical variables. The Spearman-Rho correlation coefficient was utilized to investigate associations between continuous variables that did not follow a normal distribution. The statistical significance level was set at 0.05. Analyses were performed using MedCalc Statistical Software version 12.7.7 (MedCalc Software bvba, Ostend, Belgium; http://www.medcalc.org; 2013).

Power Analysis: To adhere to the 3R principle and minimize the use of animals, statistical calculations were performed based on the study by Dogan et al.[16] Pressure values were estimated with a mean of 95 and a standard deviation of five for one group, and a mean of 105 with a standard deviation of 5.5 for another group, using seven experimental animals. A power of 0.95 and an error level of 0.05 were achieved.

RESULTS

The average weight of rats in Group C was 264.9±20.6 grams, while the average weight of rats in Group R was 270.3±19.1 grams. There was no statistically significant difference in mean weight between Group C and Group R (p=0.749). Similarly, there was no statistically significant difference in the macroscopic adhesion score (MAS) between Group C and Group R (p=1.000) (Table 1).

In Group C, the mean WTS was 3.6±0.3 N, while in Group R, it was 2.3±0.7 N. The mean WTS in Group R was significantly lower than in Group C (p=0.003). The mean ABP in Group C was 172.9±36.8 mmHg, compared to 207.5±27.2 mmHg in Group R. However, there was no statistically significant difference in mean ABP between the two groups (p=0.078) (Table 2).

The mean wound healing score (WHS) in Group C was 3.42±1.4, while in Group R, it was 3.72±1.6. There was no statistically significant difference in mean WHS between Group C and Group R (p=0.600). The mean collagen healing score (CHS) in Group C was 2.91±1.6, while in Group R, it was 3.61±1.7, with no statistically significant difference (p=0.644). The mean peritoneal healing score (PHS) in Group C was 4.7±1.8, compared to 5±1.5 in Group R. There was no statistically significant difference in mean PHS between the groups (p=0.794) (Table 3).

The mean wound tissue hydroxyproline (WOHP) level was 1±0.3 in both Group C and Group R. There was no statistically significant difference in WOHP levels between the

Table 1. Average weight and macroscopic adhesion scores (MAS) of rats in groups

Group	Group C	Group R	Total	p
W				0.749[1]
Mean±SD	264.9±20.6	270.3±19.1	267.6±19.3	
Med (Min-Max)	263.6 (234.4287.1)	268.6 (241.5-299.1)	266.1 (234.4-299.1)	
MAS (n/%)				1.000[2]
1	5 (71.4)	6 (85.7)	11 (78.6)	
2	2 (28.6)	1 (14.3)	3 (21.4)	

[1]Mann-Whitney Test; [2]Fisher's Exact Test. SD: Standard Deviation; Med: Median; Min: Minimum; Max: Maximum; W: Weight; MAS: Macroscopic Adhesion Score.

Table 2. Mean wound tensile strength (WTS) and anastomotic bursting pressure (ABP) values of rats in groups

Group	Group C	Group R	Total	p
WTS				0.003[1]
Mean±SD	3.6±0.3	2.3±0.7	2.9±0.8	
Med (Min-Max)	3.6 (3.1-4)	2.8 (1.53-2)	3.1 (1.5-4)	
ABP				0.078[1]
Mean±SD	172.9±36.8	207.5±27.2	188.9±36.2	
Med (Min-Max)	180 (110-220)	207.5 (180-240)	180 (110-240)	

[1]Mann-Whitney Test. SD: Standard Deviation; Med: Median; Min: Minimum; Max: Maximum; WTS: Wound Tensile Strength; ABP: Anastomotic Bursting Pressure.

Table 3. Average wound, colon, and peritoneal histopathology scores of rats in groups

Group	Group C	Group R	Total	p
WHS				0.600[1]
Mean±SD	3.4±1.4	3.7±1.6	3.6±1.5	
Med (Min-Max)	3 (2-6)	4 (1-6)	3.5 (1-6)	
CHS				0.644[1]
Mean±SD	2.9±1.6	3.6±1.7	3.2±1.6	
Med (Min-Max)	3 (0-5)	3 (2-7)	3 (0-7)	
PHS				0.794[1]
Mean±SD	4.7±1.8	5±1.5	4.9±1.6	
Med (Min-Max)	5 (2-7)	5 (3-7)	5 (2-7)	

[1]Mann-Whitney Test. SD: Standard Deviation; Med: Median; Min: Minimum; Max: Maximum; WTS: Wound Tensile Strength; ABP: Anastomotic Bursting Pressure.

Table 4. Wound and colon mean hydroxyproline levels of rats in groups

Group	Group C	Group R	Total	p
WOHP				0.848[1]
Mean±SD	1±0.3	1±0.3	1±0.3	
Med (Min-Max)	0.9 (0.8-1.6)	0.9 (0.7-1.6)	0.9 (0.7-1.6)	
COHP				0.406[1]
Mean±SD	1.1±0.1	1.3±0.4	1.2±0.3	
Med (Min-Max)	1.1 (0.9-1.3)	1.1 (0.8-1.9)	1.1 (0.8-1.9)	

[1]Mann-Whitney Test. SD: Standard Deviation; Med: Median; Min: Minimum; Max: Maximum; WTS: Wound Tensile Strength; ABP: Anastomotic Bursting Pressure.

groups (p=0.848). The mean colon tissue hydroxyproline (COHP) level was 1.1±0.1 in Group C and 1.3±0.4 in Group R. Again, there was no statistically significant difference in COHP levels between the two groups (p=0.406) (Table 4).

DISCUSSION

Intra-abdominal adhesions, frequently observed after abdominal surgery, pose a significant health concern. Postoperative adhesions can result in intestinal obstructions necessitating surgical intervention, as well as digestive system complications. Surgical interventions may sometimes be required to address this condition, which can lead to severe complications and increased morbidity. Furthermore, intra-abdominal adhesions can pose challenges and complications for patients requiring laparotomy for other surgical indications. These adhesions increase both the incidence and duration of surgical complications. Despite the use of numerous anti-adhesive agents to prevent abdominal adhesions, no effective treatment has been identified to date.[1] Additionally, anastomotic leakage, a common complication following colon surgeries performed in surgical clinics, increases mortality and morbidity. Despite advancements in perioperative care and surgical techniques, the incidence of anastomotic leaks has not been significantly reduced.[3] Research into the prevention and mitigation of

anastomotic leakage is therefore ongoing. In experimental studies, various materials have been utilized to address this issue, including fibrinolytic agents, anti-inflammatory agents, antibiotics, crystalloids, hydrogen-rich saline, icodextrin, liquid paraffin, mitomycin-C, phospholipids, honey, thermosensitive hydrogel (xyloglucan), boric acid, and Bletilla striata. Unfortunately, their clinical application is limited.[17] RO extract has recently emerged as one of the substances used for this purpose. The first study in the literature demonstrating the anti-adhesive efficacy of RO extract was conducted by Roohbakhsh et al.[1] According to their study, a dose-dependent reduction in abdominal adhesions was observed on the seventh postoperative day with RO extract concentrations of 2% and 4%.[1] However, Kakanezhadi et al.[18] reported that the anti-adhesive effect of RO extract was not statistically significant on the third postoperative day but became significant by the fourteenth postoperative day. In contrast to these studies, our findings revealed that RO extract at a concentration of 2% had no statistically significant effect on abdominal adhesions on the seventh postoperative day. Throughout the trial, it was observed that RO extract accumulated extensively at the abdominal midline incision site in Group R rats, leading to a statistically significant reduction in WTS compared to Group C. This finding demonstrates that RO extract impairs wound healing. While published research highlights the beneficial effects of RO extract on wound healing, there is insufficient evidence to conclusively support these claims currently.[19-22] Contrary to prior studies, the results of our investigation indicate that RO extract inhibits wound healing by significantly reducing WTS at the abdominal incision site on the seventh postoperative day. This outcome demonstrates that its use may increase the risk of evisceration during the early postoperative period following abdominal surgery.

Previous studies examining the effects of RO extract on wound healing predominantly focused on topical or cutaneous applications. Topical treatments have been reported to enhance wound healing by promoting neovascularization, fibroblast migration, and collagen formation.[5,19,23,24] However, in our study, intraperitoneal administration of RO extract was found to impair wound healing at the abdominal midline incision. Furthermore, in contrast to prior research, our findings demonstrated no significant increase in neovascularization, fibrosis, or collagen deposition in the incision area. In contrast to previous studies, it is hypothesized that the unfavorable effects on wound healing observed in our study may be attributed to differences in the application method, dosage, and timing of postoperative evaluation. Therefore, we believe that further experimental and clinical investigations are necessary to better understand the effects of RO extract on wound healing, with a focus on different doses, application methods, and phases of the wound healing process.

Based on our review of the English literature, no studies investigating the effects of RO extract on intestinal anastomosis were identified. We believe this to be the first study to demonstrate the impact of RO extract on colon anastomosis. As no study in the literature has examined the effects of RO extract on colon anastomosis, it was not possible to compare our study results directly. Our investigation revealed an increase in the levels of ABP, CHS, and COHP in the RO extract group. However, these differences were not statistically significant compared to the Group C. To better understand the effects of RO extract on colon anastomosis, further animal studies using varying doses of RO extract are needed. Anastomotic leaks following colon surgery increase morbidity and mortality, and as no effective preventive treatment currently exists, it is anticipated that further research on the effects of RO extract on colon anastomosis could contribute to clinical practice.

In accordance with the findings of our study, a notable contradiction arises: while RO extract negatively impacts wound healing, it does not adversely affect colon wound healing and even leads to a slight, albeit statistically insignificant, increase in colon anastomosis durability. It is well-known that intestinal wound healing mechanisms are fundamentally distinct from those of other tissues. For this reason, it is believed that the same active compound may exert different effects on skin wound healing and colon anastomosis.[25] These outcomes are hypothesized to result from inherent differences in the intestinal wound healing process.

The literature highlights various properties of RO, including anti-inflammatory, skin wound healing/skin flap viability enhancement, antifungal, antiviral, antibacterial, antithrombotic, antioxidant, hair growth-promoting, UV protective, and melanoma protective actions.[5-11] However, information regarding its therapeutic applications is limited. By demonstrating the effects of RO on colon anastomosis, wound healing, and abdominal adhesion in an experimental surgical model, the results of this study are also important in laying the groundwork for its clinical use.

CONCLUSION

In conclusion, postoperative peritoneal adhesions are serious complications of abdominal surgery. Intra-abdominal adhesions are a common issue during such procedures, posing substantial health risks. These adhesions can lead to intestinal obstructions requiring additional surgical interventions and causing digestive system problems. They also increase the incidence and duration of surgical complications, further manifesting as a severe financial burden on healthcare systems. As a result, numerous anti-adhesive compounds have been utilized; however, no definitive solution has yet been identified. RO extract is a compound that has only recently been explored for this purpose, with limited experimental data and no clinical data currently available. In our study, we aimed to evaluate the effects of RO extract on colon anastomosis as a surgical model, its anti-adhesive efficacy, and its simultaneous impact on wound healing in the laparotomy area, with the goal of advancing its clinical application. In line with the find-

ings of our study, it was discovered that RO extract lacks an anti-adhesive effect, contrary to previous studies. It was determined that although the effect on colon anastomosis was not statistically significant, the extract caused an increase in mean ABP and CHS. Furthermore, contrary to findings in the scientific literature, it was established that RO extract had a statistically significant negative effect on wound healing at the incision site. According to our investigation, peritoneal administration of RO extract in the early postoperative period may increase the risk of evisceration at the abdominal incision site. While it is hypothesized that RO extract may provide beneficial effects on colon anastomosis, these findings were not statistically significant. We believe that further extensive research, utilizing different doses, is necessary to clarify its impacts on colon anastomosis. Although a few studies in the literature claim an anti-adhesive effect of RO extract, our findings suggest that this claim is debatable. Therefore, it is believed that further extensive research is necessary.

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DENEYSEL ÇALIŞMA - *ÖZ*

Rosmarinus officinalis ekstraktının kolon anastomozu yapılan sıçanlarda yara iyileşmesi, kolon anastomozu ve postoperatif adezyon üzerine etkileri

AMAÇ: Karın içi yapışıklıklar cerrahi komplikasyonların görülme sıklığını ve süresini arttırmaktadır. Bu amaçla birçok yapışma önleyici madde kullanılmış ancak henüz kesin bir çözüm bulunamamıştır. Bu nedenle anastomoz kaçağının önlenmesi ve azaltılmasına yönelik çalışmalar güncelliğini korumaktadır. Bu çalışmada, *Rosmarinus officinalis* ekstraktının cerrahi model olarak kolon anastomozu üzerindeki etkilerinin, antiadezif aktivitesinin ve laparotomi bölgesinde yara iyileşmesi üzerindeki etkisinin eş zamanlı olarak belirlenmesi ve *Rosmarinus officinalis* ekstraktının klinik uygulamasını kolaylaştırmak amaçlandı.

GEREÇ VE YÖNTEM: Sıçanlar her biri yedi sıçandan oluşan iki gruba ayrıldı. Grup C (Kontrol): Kolon anastomozlu laparotomi + 2 mL izotonik solüsyon. Grup R (*Rosmarinus officinalis*): Laparotomi + kolon anastomozu, + 2 mL %2 *Rosmarinus officinalis*. Makroskobik adezyon skorlaması yapıldı ve kaydedildi. Yaranın gerilme mukavemeti, insizyon hattından alınan doku örnekleri kullanılarak değerlendirildi. Kesi hattından histopatolojik inceleme ve doku hidroksiprolin düzeyleri için doku örnekleri alındı. Anastomoz patlama basıncı kolon anastomozu segmentinden ölçüldü.

BULGULAR: Makroskobik adezyon skoru açısından Grup C ve Grup R arasında istatistiksel olarak anlamlı fark yoktu (p=1.000). Grup R'nin ortalama Yara gerilme mukavemeti değeri Grup C'ye göre anlamlı derecede düşüktü (p=0.003). Ortalama anastomoz patlama basıncı açısından Grup C ve Grup R arasında istatistiksel olarak anlamlı fark yoktu (p=0.078).

SONUÇ: Araştırmamızın bulgularına göre, ameliyat sonrası erken dönemde *Rosmarinus officinalis* ekstraktının peritoneal uygulanması, abdominal insizyon bölgesinde eviserasyon riskini arttırabilir.

Anahtar sözcükler: Kolon; anastomoz; Rosmarinus; postoperatif; yapışıklık; yara iyileşmesi.

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