Experimental
&
Clinical Article

Effects of Spray Gel Compared with The Methods of Using Interceed Seprafilm and Ringer Lactate for The Prevention of The Postoperative Adhesions

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OBJECTIVE: To compare the spray gel with the methods of using interceed, seprafilm or intraperitoneal lavage with ringer lactate, which are used to prevent the postoperative adhesions.
STUDY DESIGN: The rats were randomly divided into 5 groups each including 10 rats. Laparatomy was performed via lower median incision. The first group (group 1) served as the control (nothing was given to prevent the adhesion). In group 2, 4 cc. Ringer lactate solution was instilled into the peritoneal cavity before abdominal closure. In group 3 Interceed (2 x 3 cm) was placed to the adhesion region. In the group 4 Seprafilm (2 x 3 cm) was used for to prevent adhesions. In the last group (group 5) spray gel was used 1 - 2 cc. to form 2 mm. thickness on the cauterized surface..Statistical evaluation was made using analysis of variance Kruskal - Wallis and Mann - Whitney U Tests and the results were accepted to be significant if the P<0.01.
RESULTS: The postoperative average adhesion scores were found significantly decreased on the ringer lactate (p=0,00l), interceed (p=0,00l), seprafilm (p<0,001) and spray gel (p<0,001), groups compared to the control group.There were no statistical significant differences between the average adhesion scores of the groups which used spray gel: ringer lactate (p=0,473), interceed (P=0,888), and seprafilm (p= 1 ,000).(P>0,005).
CONCLUSION: The effectiveness of the spray gel for the prevention of adhesion formation is found similar to the methods of ringer lactate, interceed and seprafilm.

Key Words : Spray gel, Interceed, Seprafilm, Postoperative adhesion

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Introduction

Adhesion formation is considered to be an inevitable result of the surgical trauma to the peritoneal surfaces of the pelvic organs.[1] Trauma will initiate an inflammatory reaction followed by an inerease in vascular permeability and release of a fibrin-rich exudate. If fibrinolysis through the plasminogen-plasmin cascade is not effective enough the end result will be dense adhesion formation With the hope of decreasing post-surgical adhesion formation a variety of techniques have been developed to minimize the surgical trauma and several agents have been introduced to decrease the inflammatory and immunologic responses of the peritoneum.[2,3] Several surgical products have been developed to prevent adhesion formation during surgery. However, the effectiveness of these products is debatable.

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Material and Method

The experimental study is performed by the permission of ethics committee of Ondokuz Mayis University Medical Faculty in the Surgical Research center.This study was performed on a total of 50 Winstar-Albino adult female rats weighing 130-220grs.The rats were caged before two weeks the study they had been fed by 20% protein containing standart animal meal and water. All rats did not eat and drink 12 hours before the sugery. The rats were divided into five groups each group containing 10 rats.For surgical prophylaxis 100mg/kg sefazolin im is used. Group 1: Control group Group 2: Ringer Lactate Group 3: Interceed Group 4: Seprafilm Group 5: Spray gel.

Adhesion formation. During the operation. general anesthesia was induced using intramuscular ketamine hydrochloride 90 mglkg body weight and ksilazin HCl 5 mg/kg. The abdomen was shaved and prepared with povidine-iodine solution.Laparotomy was then performed under as aseptic technique via a low midline 4 cm abdominal incision. The powder of the gloves was washed by sterile serum physiologic solution.After the exposure of the horns of the bicornuate uterus;on the left horn beginning from the two cm away from the uterine bifurcation at three points 1 cm apart from each other the defect was made by electrocautery using Siemens Radiotom-612 cautery at 30 volts on the antimesenteric side,serosa and including the muscular layer. Group 1 is the control group.Before the abdominal closure nearly 4cc Ringer Lactate is applied intraperitoneally to the second group.To the injury side 2x3 cm interceed is placed in the third group.To the injury side 2x3 cm seprafilm is placed in the fourth group.For the fifth group to the injury side 2 mm thick spray gel is applied (nearly 1-2 cc).After 21 days all of the rats were sacrified by using the bolus ether inhalation. Three weeks af ter the surgical manipulation. re-laparotomy was performed to evaluate the postsurgical adhesion formatian according to the modified scoring scale based on the number, thickness and vascularity of the adhesions (Table I). Adhesion scoring was performed with the median incisions.

Table I: Distribution of adhesion scores among groups

Score	Group I	Group II	Group III	Group IV	Group V
0	0	2	2	0	3
1	1	2	7	2	6
2	2	6	1	3	1
3	7	0	0	5	0
4	0	0	0	0	1

Modified adhesion scoring scale

Score	*Number of adhesions*
0	*No visible adhesion*
1	*1 thin, easily separable, avascular adhesion*
2	*2 thin, easily separable, avascular adhesions*
3	*3 thin, easily separable, avascular adhesions*
4	*> 3 thin, easily separable, avascular adhesions or vascularized or diffuse adhesion*

The left horns were excised totaly for the histopathologic evaluation. The specimens were examined on the histopathological basis at the Pathology Departmant of Ondokuz Mayis University and looked for the granulation tissue development and the foreign body reactions by using hematoxylene eosine and Trichrome stains.The average adhesion scores among the five groups were compared . Statistical evaluation was made using analysis of variance Kruskal-Wallis and Mann- Whitney U Tests and the results were accepted to be significant if the P value was less than 0.01.

Results

The adhesion scores assessed at re-laparotomy are shown in Table II. The mean scores were (mean±SD), 4±0,9661; 0,6±0,8433;0,4±0,6992;0,3±0,4830;0,3±0,4830 in groups 1 (control), 2 (RL), 3 (Interceed), 4 (Seprafilm), 5 (Spray gel). Table III. The most dense adhesions were observed in the control group to which no medication was given; and the mean adhesion score was highest in the Control Group (Group 1) the mean adhesion score was lowest in the Seprafilm (Group 4) and Spray gel (Group 5) All groups had significantly lower mean adhesion scores than the control group($p<0,01$).There was no significant difference of mean adhesion scores among the RL (Group 2) and Interceed (Group 3) and Seprafilm (Group 4) and Spray gel (Group 5) ($p>0,05$).On the histopathologic results (Tablo III, IV); the granulation tissue development averages were very low at the ringer lactate, interceed, seprafilm and spray gel groups according to the control group (Fig I, II). ($p=0,00l$),($p=0,001$), ($p<0,001$), ($p<0,001$). There was statistically difference according to the granulation tissue development between Control Group and RL (Group 2), Interceed (Group 3), Seprafilm (Group 4) and Spray gel (Group 5) groups. All groups had significantly lower granulation tissue development than the control group ($p<0,01$). There was no significant difference between the spray gel group and the ringer lactate, interceed and seprafilm groups among the granulation tissue devolepment. ($p>0,05$). The average values of the foreign body reactions were found very low at ringer lactate, interceed, seprafilm and spray gel groups according to the control group. ($p<0,002$) and there was no statistically significant difference between the spray gel, the ringer lactate, interceed and seprafilm groups according to the average values of the foreign body reactions.($p>0,05$)

Table II: Mean adhesion scores

Group 1	Control	2,4±0,9661
Group 2	RL	0,6±0,8433
Group 3	Interceed	0,4±0,6992
Group 4	Seprafilm	0,3±0,4830
Group 5	Spray gel	0,3±0,4830

Tabel III: Granulation Tissue Development Scores Among The Groups

	Group 1	Group 2	Group 3	Group 4	Group 5
Vascular Proliferation Score	20	5	7	6	8
Inflammatory Cell Score	20	12	9	8	7
Collagen Amount Score	18	9	6	4	7
Granulation Tissue Score	58	36	22	18	22

Tablo IV: Granulation Tissue Development Mean Values Among The Groups

	VP	ICA	CA	TD
Grup 1	2 ± 0,000	2 ± 0,0000	1,8 ± 0,4216	5,8 ± 0,4216
Grup 2	1,5 ± 0,5270	1,2 ± 0,4216	0,9 ± 0,7379	3,6 ± 1,4298
Grup 3	0,7 ± 0,6992	0,9 ± 0,5676	0,6 ± 0,6992	2,2 ± 1,3984
Grup 4	0,6 ± 0,5000	0,8 ± 0,6009	0,4 ± 0,5270	2 ± 1,3229
Grup 5	0,8 ± 0,6325	0,8 ±-0,6325	0,7 ± 0,4830	2,2 ± 1,6865

VP: Vascular Proliferation, ICA: Inflammatory Cell Amount, CA: Collagen Amount, GTD: Granulation Tissue development

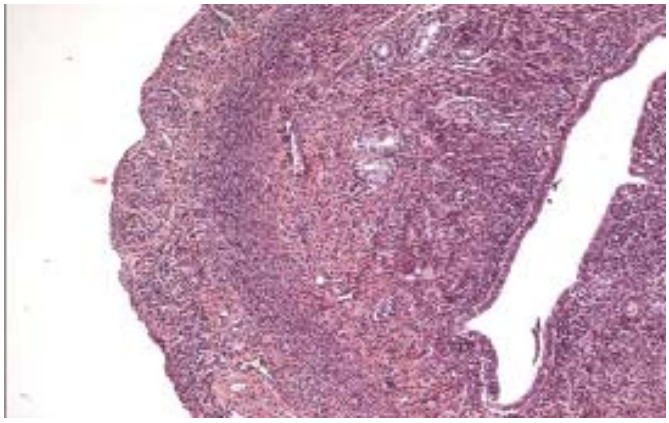

Figure I: No Granulation Tissue and Foreign Body Reaction (HE x 100)

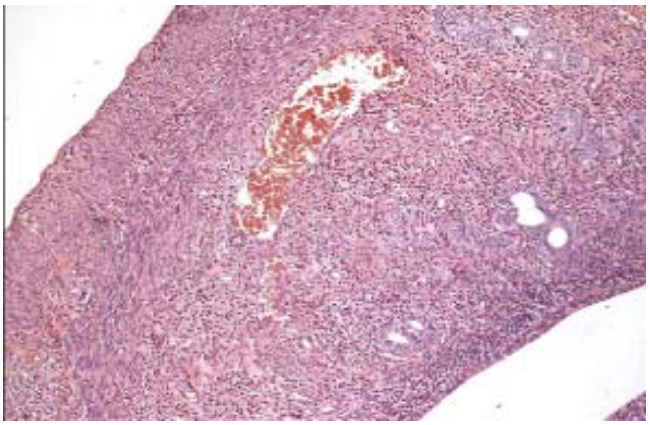

Figure II: Mild Vascular Proliferation, Significant Inflammatory Cell Infiltration, No Collagen Proliferation (HE x 100)

Discussion

Adhesion formation is induced by mechanical injury, ischaemia or introduction of foreign materials into the peritoneal cavity. Suggested methods for preventing adhesion formation include prophylactic antibiotics, intraperitoneal instillation of dextran, corticosteroid or non-steroidal anti-inflammatory drugs and synthetic barrier agents.[1,4-6] Unfortunately, none of these therapies is ideal. Ringer's lactate solution appears to be effective in preventing adhesion formation and reformation. The possible mechanism is flotation effect; whereby the contact between raw peritoneal surfaces is limited and there is dilution of fibrin and fibrinous exudate released from the injured surface [7-10]

In our study, RL is effective in decreasing the adhesion formation when compared with the control group. Other animal studies disagree and even suggest an enhancement of adhesion formation with RL. In our study,there was no statistically significant difference in adhesion formation between the Seprafilm, Spray gel,Interceed-treated and Ringer's lactate groups. In this study we demonstrate that topical use of Seprafilm and Spray gel, as described, significantly reduces postoperative intraperitoneal adhesion formation in an experimental rat model.Topical application of solutions containing hyaluronic acid have been shown to reduce adhesions after abdominal and orthopaedic surgery. The mechanism by which hyaluronic acid solutions prevent adhesion formation is unknown but may be due to a cytoprotective effect on mesothelial surfaces, which would limit intraoperative injury.[1,11,12]

Because of the high viscosity, administered hyaluronate solutions are retained in the anterior chamber of the eye and serve to protect fragile corneal endothelial surfaces during intraocular lens implantation. Injected into the joint space hyaluronic acid solutions act as lubricants to provide pain relief in those with osteoarthroses and certain temporomandibular joint disorders.[13-15]

Analyses of the demographics and the surgical procedure parameters in the Seprafilm and no treatment groups demonstrate that randomisation was successful in creating patient populations that were not different. Wrapping the uterus with Seprafilm at the completion of the myomectomy significantly reduced adhesion formation to both the anterior and posterior uterine surfaces. Failure to observe a greater magnitude of improvement may have been due to the severity of tissue damage in the model chosen and the protocol-induced limitation of treating only the uterine surface. However; it should be noted that uterine Seprafilm treatment signiticantly increased the number of women in which the anterior surface of the uterus was free of adhesions as well as increasing the number of women with at least one adnexa (i.e. tube and ovary) free of adhesions to the uterus. Thus; Seprafilm is efficacious in reducing postoperative adhesions.[12,15]

In summary, the topical use of Seprafilm and Spray gel reduces the amount and severity of postoperative intraperitoneal adhesion formation in this rat model. Seprafilm and Spray gel appear to be safe and non-toxic in amounts up to five times the effective anti-adhesion dose. The encouraging results of this study suggest that topical Seprafilm and Spray gel hold promise in the prevention of postoperative adhesion formation.

Postoperatif Adezyonları Önlemede Kullanılan İnterceed Seprafilm ve Ringer Laktat ile Sprey Jelin Etkilerinin Karşılaştırılması

AMAÇ: Bu çalışma postoperatif adezyonları önlemede kullanılan interceed, seprafilm, ringer laktat ile batın yıkama metodları ile sprey jel kullanımının etkilerini karşılaştırmayı amaçlamaktadır.

GEREÇ ve YÖNTEM: Bu amaçla ratlardan her grupta 10 tane olacak şekilde 5 grup oluşturuldu. Ratlara aşağı median insizyon ile laparatomi uygulandı. İlk grup (grup 1) kontrol grubunu oluşturdu (bu gruba adezyondan koruyucu herhangi bir metod uygulanmadı). Grup 2'deki ratlara batın kapatılmadan önce peritoneal kavite içine 4 cc ringer laktat uygulandı. Grup 3'teki ratların batınına interceed (2x3 cm) yerleştirildi. Grup 4'teki ratların batınına seprafilm (2x3 cm) yerleştirildi. Grup 5'teki ratların batınına 2 mm kalınlık oluşturacak şekilde 1-2 cc sprey jel uygulandı. İstatistiksel değerlendirme Kruskal-Wallis varyans analizi ve Mann-Whitney U testi kullanılarak yapıldı. Sonuçlar $p<0.01$ ise istatistiksel olarak anlamlı olarak değerlendirildi.

BULGULAR: Sonuçta postoperatif adezyon skorları ringer laktat ($p=0.001$), interceed ($p=0.001$), seprafilm ($p<0.001$) ve sprey jel ($p<0.001$) için kontrol grubuyla karşılaştırıldığında anlamlı oranda azalmış olarak saptandı. Sprey jel ile ringer laktat ringer ($p=0,473$), interceed ($P=0,888$) ve seprafilm ($p=1,000$) arasında istatistiksel olarak anlamlı fark bulunmadı ($P>0,005$).

SONUÇ: Sprey jelin postoperatif adezyonları önlemedeki etkisi ringer laktat, interceed, seprafilm ile benzer bulunmuştur.

Anahtar Kelimeler: Sprey jel, Interceed, Seprafilm, Postoperatif adezyon

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