

# Research Paper: Comparing Subcuticular and Transdermal Appendectomy Repairs: A Randomized Clinical Trial



Nasser Malekpour Alamdari<sup>1</sup>, Amir Shahbazzadeh<sup>1</sup>, Barmak Gholizadeh<sup>1\*</sup>

1. Department of General Surgery, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran.



**Citation:** Malekpour Alamdari N, Shahbazzadeh A, Gholizadeh B. Comparing Subcuticular and Transdermal Appendectomy Repairs: A Randomized Clinical Trial. International Journal of Medical Toxicology and Forensic Medicine. 2018; 8(3):113-118.



**Funding:** See Page 117

**Copyright:** The Author(s)

## Article info:

**Received:** 20 Nov 2017

**First Revision:** 15 Dec 2017

**Accepted:** 10 Apr 2018

**Available Online:** 01 Jul 2018

## ABSTRACT

**Background:** Appendectomy is one of the most common abdominal operations. The prevalence of appendicitis increases with increased lymphatic tissue with the maximum prevalence at the beginning of adulthood. Owing to the high prevalence of appendectomy, patients will be benefited from a better method with improvement of surgical site and management of postoperative pain and infection. Subcuticular repair method due to better scar formation and less pain is preferred to the routine repair method, if the infection rate is comparable.

**Methods:** The current study was conducted on appendectomy candidates in 2017. After providing the necessary explanations, the interested patients signed the informed consent forms and voluntarily participated in the study. The subjects were randomly assigned into two groups of randomized clinical trial with parallel design and 1:1 ratio. The sample size was 120 individuals based on previous studies. Subjects were assigned into two groups of 105 subjects each: the first group as subcuticular and the second group as transdermal accordingly. Then, they were studied and followed up.

**Results:** One week after operation, 8.5% of subcuticular and 5.7% of transdermal repairs developed localized infection, and no significant difference was observed between the two groups. One week after surgery in the first group, 10% had no pain, 36% mild pain, 27% moderate pain, and 27% severe pain. In the second group, 7% had no pain, 36% mild pain, 30% moderate pain, and 27% severe pain. Therefore, there was no significant difference between two groups in this regard.

**Conclusion:** There was no significant difference in the surgical wound infection rate between two methods. Accordingly, subcuticular repair was suggested as the preferred method owing to its better scar formation.

## Keywords:

Appendectomy, Wound healing, Surgical wound infection, Suture techniques, Pain

## 1. Introduction



Although acute appendicitis has been a common medical problem for centuries, people did not know that appendix like other or-

gans can cause diseases until the early 19<sup>th</sup> century [1]. Moreover, appendicitis is the most common cause of acute abdominal operation [2-4]. In Western countries, about 7% of people develop appendicitis during their lifetime [5]. This figure is 10% in another reference book [3].

\* Corresponding Author:

Barmak Gholizadeh, PhD

Address: Department of General Surgery, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Tel: +98 (914) 3821369

E-mail: barmak.gholizadeh@gmail.com

Acute appendicitis may occur at any age, but its peak age is in the second and third decades of life. Although a smaller courier is also repeated in older ages, the incidence rate in males to females is 1.5:1 [3]. The effect of lumen blockage on appendicitis has been documented. It is also confirmed that in appendicitis, the presence of bacteria in the appendicular lumen is essential, and the duct obstruction in the sterile environment of the lumen creates only a mucocoele [4]. Blockade by fecaliths was reported in 40% of acute simple appendicitis, 65% of gangrenous appendicitis without rupture, and 90% of acute appendicitis with rupture [6].

Acute appendicitis is the most common cause of abdominal pain. In this disease, pain is followed by loss of appetite. Primarily, disseminated pain is in the lower epigastrium or umbilical region (visceral stage of pain) and is relatively intense and constant. Sometimes abdominal cramps are also added. After 1 to 12 hours (usually 4-6 hours), the pain gets localized in the Right Lower Quadrant (RLQ) (the somatic stage of pain) [7]. With the disease progression, rupture of the appendix, and formation of diffuse peritonitis, pain spreads throughout the abdomen [4, 8, 9].

Leukocytosis is the only laboratory marker and one of the five diagnostic principles in acute appendicitis. In addition to the importance of timely diagnosis, proper treatment with the least complication during and after the operation is of great importance. Today, the only well-known and acceptable treatment for appendicitis is operation. Appendectomy is performed both in open and laparoscopic methods throughout the world. The main problem with open appendectomy is the surgical scar and its complications.

The methods supported by most surgeons to repair surgical wounds are the simple and separate transdermal techniques. These methods are mainly used due to fear of infection in surgical site. However, the subcuticular method has cosmetically better outcomes. The current study aimed to compare subcuticular and transdermal appendectomy wound stitching methods in terms of pain, infection rate, and patient's satisfaction in order to determine the more suitable method.

## 2. Materials and Methods

The current randomized clinical trial was performed on patients undergoing open appendectomy at Shahid Modarres Hospital in 2017. After providing the necessary explanations, the interested volunteers were asked to sign the informed consent forms. Then, they were randomly assigned into two groups of randomized clinical trials with parallel design and 1:1 ratio. The sample size

was 210 subjects based on previous studies [10]. The subjects were studied and followed up in two groups of 105 patients each: the first group as subcuticular method and the second group as transdermal method.

The inclusion criteria were the patients with appendicitis symptoms referred to the Emergency Department of Shahid Modarres Hospital and diagnosed with appendicitis based on their medical history and physical examinations. The exclusion criteria were age under 10 or above 45 years, normal appendix, advanced or perforated appendicitis, delayed appendectomy, diabetes, patients on chemotherapy, the ones receiving corticosteroids or antifungal drugs, immunodeficiency diseases, and history of radiotherapy.

First, the advantages and disadvantages of the two methods were explained to the patients. Then the interested patients signed the informed consent form for participation. Next, the patients were randomly assigned into two groups. In the first group, the subcuticular method was used to repair surgical wound and in the second group, the transdermal method was employed. In the subcuticular method, the subcutaneous tissue was repaired with absorbable stitches, and then the skin was restored subcutaneously with 3-0 nylon stitches.

In the transdermal method, the subcutaneous tissue was repaired with absorbent stitches and then the skin was restored simply with 3-0 nylon stitches. Patients were examined twice, one week and one month after the operation by the same surgeon and were compared in terms of side effects such as wound infection, purulent discharge, wound opening, and systemic infection. Observations were recorded on specific forms for each patient. Also, the memory of the patient was evaluated for acute postoperative pain during the first week after operation. The pain intensity in the recent study was assessed based on Visual Analogue Scale (VAS). In this method, the pain intensity is determined by the numbers; for example, no pain is 0, mild pain 1, middle pain 2, severe pain 3, and very severe pain 4. This method can be used in people over 10 years old. If the patient's pain continued during the interview, additional questions about the pain features and its impact on daily living activities, sleep and behaviors, as well as the history of other chronic pains were asked.

The total number of patients was 251, of which 41 subjects were excluded due to delayed appendectomy, normal appendix, or other exclusion criteria. Finally, 210 appendectomy cases were evaluated. Among the 41 excluded patients, four had diabetes, 20 used corticosteroids, 12 patients had normal appendix, four

perforated appendix, and a patient with the history of radiotherapy was excluded. The collected data were analyzed with SPSS.

### 3. Results

In the current study, 210 cases of appendectomy including 105 subcuticular and 105 transdermal repair methods were evaluated. The Mean $\pm$ SD age of the patients was 20.85 $\pm$ 6.7 and 20.6 $\pm$ 6.85 years in the first and second groups, respectively. There was no significant difference between two groups in this regard ( $P=0.8$ ). Also in the first group, 46% of the subjects were female and 54% male. In the second group, 47% were female and 53% male. There was no significant difference between two groups in terms of gender ( $P=0.89$ ) (Table 1).

One week after the operation, 8.5% of subcuticular repairs (subcutaneous suture) and 5.7% of transdermal repairs (simple suture) developed local infection, but there was no significant difference between two groups in this regard ( $P=0.42$ ). One week after the operation, 5.7% of

the subcuticular repaired wounds (subcutaneous suture) and 4.7% of the transdermal repaired wounds (simple suture) had purulent discharge and their wounds opened, although the difference between the groups was insignificant ( $P=0.65$ ). One week and one month after surgery, no systemic infection was observed in the two groups.

One week after the operation, in the first group, 10% had no pain, 36% mild pain, 27% moderate pain, and 27% severe pain. In the second group, 7% had no pain, 36% mild pain, 30% moderate pain, and 27% severe pain. There was also no significant difference between two groups in this regard (Figure 1). Also in the one-month follow-up, the mean thickness of the scar was 1.2 and 2.9 mm in the subcuticular and transdermal groups, respectively. The difference between two groups was statistically significant (Table 2).

### 4. Discussion

In the current study, the transdermal and subcuticular methods in appendectomy were compared with

**Table 1.** Demographic characteristics of the study participants

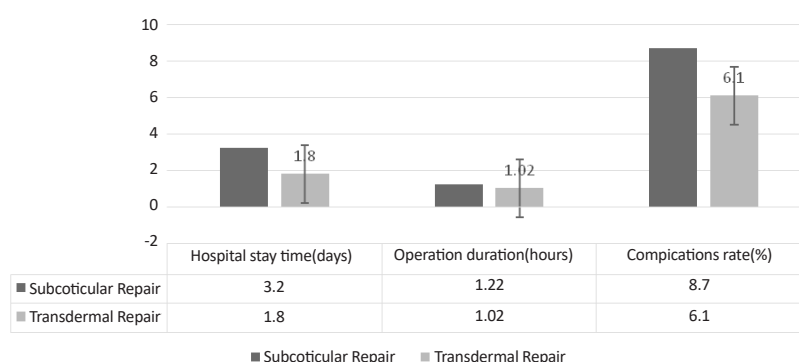
Variable	Type of Repair	Subcuticular	Subdermal	P
Age (Mean $\pm$ SD), y		20.85 $\pm$ 6.7	20.6 $\pm$ 6.85	0.8
Gender	Female, n	48	49	0.89
	Male, n	57	56	
BMI (Mean $\pm$ SD), kg/m <sup>2</sup>		23.8 $\pm$ 3	24.2 $\pm$ 2	0.59

International Journal of  
Medical Toxicology & Forensic Medicine

**Table 2.** Comparison of the relative frequency of postoperative local complications based on the two wound repairing methods

Variable	Type of Repair	Subcuticular	Subdermal	P
Local infection, No. (%)		9(8.5)	6(5.7)	0.42
Purulent discharge, No. (%)		6(5.7)	5(4.7)	0.65
Wound dehiscence, No. (%)		6(5.7)	5(4.7)	0.78
Level of pain, No. (%)	No pain	8(7)	8(7)	0.99
	Mild	35(33)	34(32)	
	Moderate	26(24)	26(24)	
	Severe	26(24)	26(24)	
	Not remembered	13(12)	13(12)	
Scar thickness, mm		1.2	2.9	0.001

International Journal of  
Medical Toxicology & Forensic Medicine



**Figure 1.** Comparison of the duration of hospital stay, duration of the surgery, and rate of postoperative complications between the studied repairing methods

respect to wound infections and wound healing complications. There was no significant difference between two methods. In the study, the subcuticular method by non-absorbable stitches was used in patients with uncomplicated appendicitis, and more satisfaction in terms of wound appearance and complications was reported compared with the ones undergoing transdermal method. However, there was no significant difference between the groups in terms of pain.

In a study by Pauniah et al. on children undergoing appendectomy, there were no significant differences in terms of inflammatory markers of the wound and its appearance. However, the surgical wound dehiscence was observed in some patients of transdermal group [11]. Results of a study by Foster et al., on 127 patients indicate a significant increase in appendectomy wound infection rate in patients undergoing subcuticular method with absorbable stitches compared with the ones undergoing transdermal repair with non-absorbable nylon stitches [12].

Nevertheless, such differences were not observed between two groups in our study and the difference between the study results can be attributed to the type of applied stitches. In a systematic review by Gurusamy et al. the advantages and disadvantages of transdermal and subcuticular repair methods in non-gynecologic abdominal surgeries were compared and the obtained results showed wound dehiscence rate decrease in subcuticular method [13].

In the study by Onwuanyi and Ebvumawan, the appendectomy wounds of 100 patients were randomly repaired with subcuticular or transdermal method. In the subcuticular group, the average wound closure time and cost were significantly lower than those of the transdermal method, but the wound infection rate was similar in the two groups [10]. In the study by Serour et al. ap-

pendectomy wounds were repaired with either subcuticular or transdermal methods and the complications were not significantly different between the two groups, but in terms of better appearance and no need for suture removal, subcuticular method was preferred to the transdermal one [14]. Results of their study were in line with those of the current study.

However, in recent studies, subcuticular repair methods are introduced as safe and more practical techniques, especially for children and adolescents [11]. In the study by Vipond et al., the absorbable and or non-absorbable Prolene® stitches were used subcuticularly for surgical wound repair on 100 patients, and the results showed no statistically significant difference between the groups in terms of subcuticular repairs using absorbable and non-absorbable stitches [15]. Mehta et al. performed a rat model study to determine the impact of subcutaneous absorbable sutures on the incidence wound infection. They studied 30 rats in two groups under controlled conditions.

The same lesions were created on their back and contaminated with a certain amount of bacteria. Then, each group underwent transdermal or subcuticular repairing technique. Inflammation, exudate, edema, necrosis, and infection were significantly higher in the subcuticular group compared with the transdermal group [16]. The difference between their results and those of the current study can be attributed to different surgical conditions, as well as different methods, stitches, and equipment.

The advantage of the transdermal method was the lower risk of wound infection due to fewer use of subcutaneous suture and foreign bodies. By the way, no significant difference in wound infection rate was observed between the two methods in our study. Regarding the limitations of the study, the small sample size and single-center de-

sign are noteworthy. In this regard, more extensive studies with long-term follow-up are recommended.

## 5. Conclusion

In the current study, appendectomy wounds were repaired using two different methods. The advantage of the subcuticular method was better scar formation due to lack of epidermal suture. The advantage of the transdermal method was the lower risk of wound infection due to fewer use of the suture and foreign bodies. Finally, no significant difference was observed in the wound infection rate between the two methods.

Acute postoperative pain in surgical site is common in appendectomy and can affect the daily life activities of the individual. Persistence and severity of pain are not associated with the employed wound healing methods. In the current study, only a significant difference was observed between the two groups in terms of better scar formation in favor of the subcuticular group. There was no significant difference between the two groups with respect to pain and infection rate. Based on the above mentioned results, to repair appendectomy wounds the subcuticular method is recommended.

## Ethical Considerations

### Compliance with ethical guidelines

The study protocol was approved by Ethics Committee of Shahid Beheshti University of Medical Sciences. All procedures were performed according to the guidelines of the Helsinki declaration. The IRCT registration code was IRCT20161217031440N1.

### Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for profit sectors.

### Conflict of interest

The authors declared no conflict of interest. The authors declare that manuscript has been read and approved by them and the manuscript represents honest work. The authors' contribution is as follows: Nasser Malekpour Alamdari and Barmak Gholizadeh: Study conception and design, drafting of manuscript, acquisition of data, and critical revision. Barmak Gholizadeh and Amir Shahbazzadeh: Acquisition of data and revision of manuscript.

## Acknowledgements

The authors would like to express their gratitude to the operating room staff who helped us with the performance of this study.

## References

- [1] Townsend CM, Beauchamp RD, Evers BM, Mattox KL. Sabiston textbook of surgery. Amsterdam: Elsevier Health Sciences; 2016.
- [2] Kotiluoto S, Pauniah SL, Helminen M, Kuokkanen H, Rantanen T. Wound healing after open appendectomies in adult patients: A prospective, randomised trial comparing two methods of wound closure. *World Journal of Surgery*. 2012; 36(10):2305-10. [DOI:10.1007/s00268-012-1664-3] [PMID]
- [3] Kumar V, Abbas AK, Aster JC. Robbins basic pathology e-book. Amsterdam: Elsevier Health Sciences; 2017.
- [4] Kellum JM. Maingot's abdominal operations. *Annals of Surgery*. 2008; 248(5):893-4. [DOI:10.1097/SLA.0b013e31818b7417]
- [5] Flum DR, McClure TD, Morris A, Koepsell T. Misdiagnosis of appendicitis and the use of diagnostic imaging. *Journal of the American College of Surgeons*. 2005; 201(6):933-9. [DOI:10.1016/j.jamcollsurg.2005.04.039] [PMID]
- [6] Brunicaudi F, Andersen D, Billiar T, Dunn D, Hunter J, Matthews J, et al. Schwartz's principles of surgery. New York: McGraw-Hill Education; 2014. [PMCID]
- [7] Kosloske AM, Love CL, Rohrer JE, Goldthorn JF, Lacey SR. The diagnosis of appendicitis in children: Outcomes of a strategy based on pediatric surgical evaluation. *Pediatrics*. 2004; 113(1):29-34. [PMID]
- [8] Ditillo MF, Dziura JD, Rabinovici R. Is it safe to delay appendectomy in adults with acute appendicitis? *Annals of Surgery*. 2006; 244(5):656-60. [DOI:10.1097/01.sla.0000231726.53487.dd] [PMID] [PMCID]
- [9] Eldar S, Nash E, Sabo E, Matter I, Kunin J, Mogilner JG, et al. Delay of surgery in acute appendicitis. *The American Journal of Surgery*. 1997; 173(3):194-8. [DOI:10.1016/S0002-9610(96)00011-6]
- [10] Onwuanyi O, Evbuomwan I. Skin closure during appendectomy: A controlled clinical trial of subcuticular and interrupted transdermal suture techniques. *Journal of the Royal College of Surgeons of Edinburgh*. 1990; 35(6):353-5. [PMID]
- [11] Pauniah SL, Lahdes Vasama T, Helminen M, Iber T, Mäkelä E, Pajulo O. Non-absorbable interrupted versus absorbable continuous skin closure in pediatric appendectomies. *Scandinavian Journal of Surgery*. 2010; 99(3):142-6. [DOI:10.1177/145749691009900308] [PMID]
- [12] Foster G, Hardy E, Hardcastle J. Subcuticular suturing after appendectomy. *The Lancet*. 1977; 309(8022):1128-9. [DOI:10.1016/S0140-6736(77)92385-6]
- [13] Gurusamy KS, Toon CD, Allen VB, Davidson BR. Continuous versus interrupted skin sutures for non-obstetric



surgery. 2014; 14(2):CD010365. [DOI: 10.1002/14651858.CD010365.pub2] [PMID]

- [14] Serour F, Efrati Y, Klin B, Barr J, Gorenstein A, Vinograd I. Subcuticular skin closure as a standard approach to emergency appendectomy in children: Prospective clinical trial. World Journal of Surgery. 1996; 20(1):38-42. [DOI:10.1007/s002689900007] [PMID]
- [15] Vipond M, Higgins A. Subcuticular prolene or PDS for skin closure. Journal of the Royal College of Surgeons of Edinburgh. 1991; 36(2):97-9. [PMID]
- [16] Mehta PH, Dunn KA, Bradfield JF, Austin PE. Contaminated wounds: Infection rates with subcutaneous sutures. Annals of Emergency Medicine. 1996; 27(1):43-8. [DOI:10.1016/S0196-0644(96)70295-0]

Archive of SID