

# BUTTONHOLE ACCESS SURGERY FOR ACUTE APPENDICITIS – AN UNDERESTIMATED SURGICAL SKILL

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## ABSTRACT

**Background:** In this arena of minimally invasive surgery, surgeons have been compelled to combat the pathologies through smaller incisions to lessen the toll of surgery in terms of cosmesis. **Objective:** To describe the outcome of buttonhole access surgery in uncomplicated acute appendicitis. **Methodology:** This was a quasi experimental study, conducted over a period of four years, 1<sup>st</sup> January 2010 to 31<sup>st</sup> March 2015, we performed appendectomies among 213 thin lean cases (BMI  $\leq$  20 kg/m<sup>2</sup>) of uncomplicated acute appendicitis (based on Alverado Score  $>$ 6) through buttonhole access which were attempted through a small incision of 1.5-2cm size placed usually lower down in pelvis so could be hid ed easily in undergarments. Data regarding demographics, clinical features, operative time, hospital stay, postoperative additional analgesic requirements and complications if any was collected and analyzed through SPSS 20. **Results:** The mean BMI of the patients was 18.94 $\pm$ 0.88 kg/m<sup>2</sup> and the mean Alverado score at the time of admission was 8.16 $\pm$ 1.01. Through buttonhole access, appendectomies were successfully accomplished in 205 (96.24%) patients (mean incision length 1.887 $\pm$ 0.156 cms). Mean operative time was 19.69 $\pm$ 6.21 minutes. No intraoperative complication was noticed. 209 (98.12%) patients were discharged within 24 hours of operation. The only postoperative complication was small seroma which developed in only 2(0.93%) cases. No scar related complications was observed over a period of six month follow up. There was no mortality. **Conclusion:** Buttonhole access for uncomplicated acute appendicitis is feasible and safe to perform in thin lean patients where diagnosis is sure.

**Keywords:** Buttonhole access surgery, Uncomplicated acute appendicitis, Lean patients

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## INTRODUCTION

Acute appendicitis is one of the condition faced by 7-9% of male and female.<sup>1</sup> Appendectomy is the procedure of choice usually offered to them. However, this procedure is not out of morbidity and mortality which may range from 5.2% -11.3% and 0% - 0.24% respectively.<sup>2,4</sup> Along with that another issue related to this procedure is the scar mark, especially among the young female population.<sup>5</sup>

Although, recent advances in laparoscopic surgery like single incision laparoscopic surgery & natural orifice trans luminal endoscopic surgery has come up with proven cosmetic benefits, it never puts open surgery outdated.<sup>6,7</sup> Even in this era of surgery, gridiron incision which breaches the principles of cosmesis frankly is still very popular especially among hands of beginners.<sup>8,9</sup> More experienced surgeons may use Lanz's incision (which follows the transvers skin creases) to deal with this emergency, but this is sometimes not even sufficient to fulfill the satisfaction of patients due to its length ( $>$ 2cm) and it cannot be hid ed from exposure.<sup>10,11</sup>

Now a day, practices in open surgery are diverted to decrease the postoperative scar magnitude and visibility by replacing big lengthy incisions to targeted nicks which may be hid ed from revelation.<sup>12</sup> Numerous techniques for access of appendix had been described and are in practice in open surgery for appendectomy until now.<sup>13,14</sup> Buttonhole access for appendectomy is one of the techniques which has been in exercise for several years but existing documented material is very little about it.<sup>15</sup>

This technique is not new but had been randomly practiced by different surgeons at different places which has caught up with different names like mini-appendectomy and bikini skin incision. Surgeons have used an incision length ranging from 2-5cm.<sup>16,17</sup> This also become an interesting topic as there is also paucity of data in this regard. This has urged us to document the outcome of buttonhole technique which utilizes an incision length of 1.5 -2cm drawn in right lower quadrant of abdomen, for acute appendicitis.

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## METHODOLOGY

This quasi experimental study included 213 selected cases of acute appendicitis of age >12 years, both gender, registered from accident and emergency departments of three tertiary care units (i.e. Services hospital Lahore, Rasheed hospital Lahore and Sharif Medical City Hospital Lahore) from a period of 1<sup>st</sup> January 2010 to 31<sup>st</sup> March 2015.

After obtaining written informed consent, the procedure was offered to all thin lean patients (BMI < 20) who were diagnosed as uncomplicated acute appendicitis on basis of Alvarado score > 6 with short history of right iliac fossa pain (< 24 hours).

Radiological assessment (X-ray and ultrasound of abdomen and pelvis) was mandatorily done in every patient to exclude any other pathology that included ureteric colic, ovarian cyst, uterine fibroid and mesenteric lymph adenitis. Exclusion criteria were doubtful diagnosis, complicated acute appendicitis (peritonitis), palpable appendicular mass, pregnant patients, and previous lower abdomen surgeries.

Routine groundwork of surgery was similar to that of appendectomy surgery. The operation room set-up and patient position was analogous to that of a conventional open appendectomy. Preoperatively single dose of 1gram Injection Aventrix® (Ceftriaxone) was administered. Surgery was carried out under general or spinal anesthesia. Patient was prepared and draped in a standard fashion. Before induction of anesthesia, while patient was lied down in supine position on operative table, site of incision was marked pre operatively at point of maximum pain and tenderness in right iliac fossa by the surgeon. This point was usually lower in right iliac fossa, below the level of Mc Burney's point. Incision at this site carries the benefit that it can be concealed in undergarments. Right iliac fossa was palpated again for appendicular mass under general anesthesia. A skin crease incision of buttonhole size (~ 1.5 – 2 cm) was made at already marked point over the skin of right lower quadrant by using surgical blade no. 15. Subcutaneous tissue was divided in the line of incision with help of diathermy and retracted with two small lengenbeck's retractors. External oblique aponeurosis was exposed and incised in the line of direction of fibers. Underlying aponeurosis of

internal oblique and transversus abdominus muscle were splitted. Peritoneum approached and was clinched up between two hemostats and cut it in the line of skin incision with help of scissor after opening it first with a small nick.

After approaching the abdominal cavity, per operative signs of acute appendicitis i.e serous inflammatory fluid, greater omentum in right iliac fossa, were checked. A third lengenback's retractor was used in a pattern of triangulation between all three retractors, for required retraction. Appendix was traced in the same manner as in the traditional open appendectomy by identifying and following the tenia coli of caecum up to the base of appendix, without delivering the caecum in wound as practiced in conventional open appendectomy. After recognizing appendix, it was held by two Babcock and was brought outside the wound (Figure I). Rest of the procedure of appendectomy was done as per standard protocol i.e a window was created near base of appendix inside the mesoappendix for secure ligation of appendicular artery with Vicryl no.1 (absorbable), and then mesoappendix was detached from appendix with help of scissor. Base of appendix was ligated with Vicryl no.1 and then amputated. The stump of the appendix was cleaned with saline soaked gauze and was delivered inside the peritoneal cavity. With aid of roll gauze, any fluid inside the peritoneal cavity was mopped. Purse string stitches was applied on peritoneum with absorbable suture (Vicryl 3/0). Divided aponeurosis of external oblique muscle and splitted underlying muscles were approximated by absorbable suture (Vicryl 2/0). Injection bupivacaine in a dose of 2mg/kg was infiltrated in wound.

**Figure I: (A,B,C): Appendixes delivered through buttonhole access and are grasped with help of Babcock's forceps.**



Skin wound was closed by applying subcuticular stitches (Prolene 3/0). A small gauze dressing with tape was done. Specimens of appendectomy were sent for histopathological analysis. Intravenous fluids (500cc ringer lactate) and analgesics (single intravenous dose of paracetamol) were administered.

Additional analgesia (Injection Nalbuphin in dose of 1mg/kg body weight) was injected intravenously on demands of patient subjectively during the hospital stay. Early mobilization was encouraged and oral feeds were commenced as appropriate depending on return of bowel function. The patients were then discharged with the advice on Tab. Paracetamol 500 mg three times a day for next two days. Complications if any were dealt accordingly. Skin sutures were removed on 7th postoperative day.

Data including patient's demographics, operative outcome (duration of surgery, the need to extend incision or to make another incision), length of hospital stay, pathologic examination of the specimens and both intraoperative complications (like injury to bowel or viscera or bleeding from mesoappendix or damage to appendix itself) and postoperative complications (like urinary retention, wound seroma, hematoma, pelvic abscess, or fecal fistula) were assembled. Patients were followed upto six months for any scar related complications like keloid formation, incisional hernia or adhesion obstruction. The data was entered in to SPSS version 20 computer program and analyzed accordingly.

## RESULTS

Out of 213 selected patients, 99 (46.47%) were males and 114 (53.52%) were females with a mean age of  $25.65 \pm 10.73$  years. The mean BMI was  $18.94 \pm 0.88$  kg/m<sup>2</sup>. All patients had history of right iliac fossa pain. There was migration of pain in 101(47.42%) patients, nausea in 149(69.95%), vomiting in 45 (21.12%) and anorexia in 195 (91.54%) patients. Temperature  $>37.6$  °C was recorded in 26 (12.2%) patients. Right iliac fossa tenderness and rebound tenderness were elicited in all (100%) patients. Elevated total leucocyte count ( $>16,000$ ) was reported in 65(30.51%) patients. The mean Alverado score was  $8.16 \pm 1.01$ . Appendectomy via buttonhole access was accomplished successfully in 205(96.24%) patients and in 8(3.76%) patients extension of incision was required. Acute inflammation of

appendix was found in all patients. Appendix was found retrocaecal in 137(64.32%) patients, pelvic in 68(31.92%) patients, retrocaecal and subserosal in 5 (2.34%) patients and subhepatic in 3(1.40%) patients. No intra and postoperative complications were observed over a period of two months follow up. The outcomes of procedure are shown in table I.

**Table I: Findings and outcome of buttonhole access surgery for acute appendicitis**

Variables		Number (n)	% age
Mean incision length (cm)	Buttonhole access (Mean $\pm$ SD) (n=205)	1.887 $\pm$ 0.156	
	Extended incisions (Mean $\pm$ SD) (n=8)	5.825 $\pm$ 2.754	
	Total (Mean $\pm$ SD) (n=213)	2.036 $\pm$ 0.915	
Mean Operation time (minutes) (Mean $\pm$ SD)		19.69 $\pm$ 6.21	
Mean Hospital duration (hours) (Mean $\pm$ SD)		18.68 $\pm$ 4.44	
Patients discharged within first 24hours of operation		209	98.12
Re-exploration required		0	0
Postoperative additional analgesia requirement		7	3.28
Peroperative complication	Visceral injury	0	0
	Bleeding from mesoappendix	0	0
Postoperative complication	Urinary retention	0	0
	Wound seroma	2	0.93
	Wound hematoma	0	0
	Wound infection	0	0
	Pelvic abscess	0	0
	Fecal fistula	0	0
Mortality		0	0
Follow up	Re-exploration for adhesion obstruction	0	0
	Incisional hernia	0	0
	Scar complications (Keloid)	0	0

## DISCUSSION

Surgical removal of the inflamed appendix is the strategic treatment of acute appendicitis, but the practice has been much transformed with the introduction of minimally invasive techniques in general surgery.<sup>18</sup> Keeping in mind the background of appendectomy procedures, we herein describes outcome of a skill which is superior to orthodox open surgery but somewhat parallel to minimal invasive surgery in selected cases in terms of cosmesis. The very first mentioning of the term buttonhole in literature is attributed to Bertha Van Hoosen.<sup>19</sup> Being in practice, it failed to find an equivalent space in literature as other techniques of appendectomy did. So, it remained underestimated in all times. This has become a fascinating topic because this technique has served a number of patients who are very much conscious about scar of their surgery as it's only the

element, that patient notices after the surgery and that the only outcome of the surgery in context of patient, besides getting rid of the symptoms.

In literature, there are only a few studies on this mini incision open appendectomy techniques.<sup>20</sup> In comparison to our buttonhole access surgery where we first mark most aching point over the skin in right iliac fossa preoperatively, the Mc Burney's point and lateral border of right rectus muscle were marked in a study of Bhasin SK et al where he draws a transverse skin incision of 2.5 to 3.5 cm length from lateral border of right rectus towards Mc Burney's point.<sup>21</sup> We utilized 1.5-2cm skin crease incision at a site of maximum tenderness that is lower down in right iliac fossa below Mc Burney's point and away from lateral border of right rectus muscle. Bhasin,<sup>21</sup> also divided anterior rectus sheath (later closed with chromic catgut) and retracted rectus medially for adequate exposure while we only divided aponeurosis of external oblique muscle and splitted underlying internal oblique and transversus abdominus muscle fibers. Retracting the rectus muscle medially may impair its innervation and can result in its weakness and hernia. In Bhasin technique, skin incision was extended in four cases and by partially dividing the rectus, external and internal oblique muscles adequate access to appendix was achieved.<sup>21</sup> However we got proper exposure for difficult cases by extending the skin incision and further dividing the external oblique aponeurosis and splitting the underlying a lateral abdominal muscles. In 1998, Hae-Hyeon executed open

appendectomy via 1.5-2cm skin incision at Mc Burney's point after visualizing abdominal cavity initially by the use of laparoscope through that incision.<sup>22</sup> In some comparative studies between conventional multiport laparoscopic appendectomy and mini incision open appendectomy, variety of small incision were used e.g. 2-3cm curvilinear muscle splitting incision at Mc Burney's point<sup>23,24</sup> or 1.5-2cm oblique incision were made over most painful spot in right iliac fossa,<sup>25</sup> in order to complete mini open appendectomy.

In our study of 213 patients, thin lean patients of BMI 18-20 with uncomplicated acute appendicitis were subjected to emergency open appendectomy via buttonhole access surgery. The incision length was 1.5 to 2cm in our study which is comparable to Hae-Hyeon S study.<sup>22</sup> We encountered with problematic appendectomy in 8(3.76%) cases where we have to prolong incision to locate and to extract appendix. In neither case, a second incision at any other place for the procedure was made. Wound seroma was observed in 2(0.93%) patients and these are those patients in which incision length were amplified. None other minor and any major complication were noticed in our study. The mean operative time in our study was  $19.69 \pm 6.21$  hours, nearer to mean operative time in Bhasin SK study.<sup>21</sup> The frequency of patients requiring for additional dose of analgesia required 3.28 % and was comparable to other studies as shown in table II.<sup>21,19</sup> The mean hospital stay in our study was  $18.68 \pm 4.44$  hours, equivalent to mean hospital stay in the study of Özsan İ et al.<sup>25</sup>

Table II: Comparison of various studies of mini open (Buttonhole) appendectomy

Study (year)	No of patients (n)	Incision length (cm)	Incision extension	Complication (%)	Operative time (min.)	Post op analgesia (doses)	Hospital stay (days)	Return to routine activities(days)	Cosmetic results (%)
Hae-Hyeon S. 1998 (22)	-	1.5-2	-	-	30.7	0.9	4.1(2-7)	7.6(5-14)	-
Bhasin SK et al.,2005(21)	100	2.5-3(2.7)	4 %	8(minor)	13-45(17.4)	2-5(2.13)	2-7(2.3)	7-10(8.2)	96
ZHOU Bing-kun et al., 2006(26)	204	2-3	-	-	-	-	3.5	8-15	-
Li Huochuan et al.,2009(27)	-	2.7	-	-	30	6	5	7-10	100
Meirong LIU et al., 2009(28)	-	-	-	-	39.5	7.9	3.5	12.2	-
Shah B et al., 2013(23)	40	2-3	5.17%	6.66	44.41	2.53	2.25	8.22	2.78 (out of 3)
Özsan İ et al, 2014(25)	33	1.5-2	-	12.1	$24.57 \pm 5.87$	-	$18.03 \pm 3.51^*$	-	96.96
Zhang hui- cai 2015(29)	50	$3.25 \pm 0.25$	-	2	-	-	3.2	-	96
Fatih Çiftçi.2015(24)	121	3	NA	7.4	$50.9 \pm 19.9$	18 (14.8)	$28.92 \pm 21.93^*$	5 (3-15)	NA

This technique may also accomplish the ambition of a lot of surgeons who are attracted towards minimally invasive surgery. This may be a cost effective alternative to laparoscopic surgery in which we have to put three or four port size incisions of approximately 25 -30 mm or more expansive minimally invasive surgeries. However, only selected cases may be picked up to rehearse this skill.

One of the limitation of this technique is that it is not suitable to deal with other pathology which may be found incidentally during the appendectomy. To overcome this problem, we selected the cases of Alverodo score >6 (almost appendicitis, or high likely of appendicitis) and excluded even all those cases even the diagnosis was compatible but not sure (i.e. Alverado score 5 or 6). However, if appendix is found normal or any other pathology is suspected during surgery, this small incision may be closed and diagnostic laparoscopy through transumbilical camera port may be proceeded or this incision may be used as a port site. And if the facilities of diagnostic laparoscopy are not available, another incision like grid iron, paramedian or midline laparotomy incision may be easily placed separately as per requirements without any significant morbidity over abdominal wall. Otherwise, this incision can be used for drain placement. However, in our study, we did not need either diagnostic laparoscopy or separate incisions.

Although it is not an alternative to laparoscopic approach but it may serve as a bridge between the open and laparoscopic surgery due to its small and comparable incision length. In future we need to compare its cosmetic outcome with other laparoscopic surgery techniques.

## CONCLUSION

The practice of buttonhole access to appendectomy is feasible and safe to perform in thin lean patients with uncomplicated acute appendicitis in which diagnosis is almost sure. Due to its exceptionally smaller incision length, it opens a window of minimally invasive approach in the field of open surgery.

### Conflict of interest:

There is no conflict of interest among all authors.

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