

Stump Appendicitis: Does it Occur More Frequently after Laparoscopic or Conventional Appendectomy? - Report of a Case

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Abstract: We here present a case of stump appendicitis as a late complication after laparoscopic appendectomy. The literature showed that the occurrence of stump appendicitis correlated with the length of the remaining appendix stump. To prevent stump appendicitis it is important to correctly identify the caecum base and to ensure the complete removal of the appendix in both surgical techniques. Should this not be possible with the laparoscopic technique, then an open resection should be considered.

Keywords: Appendicitis, surgery, appendectomy, stump appendicitis.

INTRODUCTION

Acute appendicitis is one of the most common surgical emergencies worldwide [1]. The obstruction of the appendix lumen via an appendicolith, a lymphoid hyperplasia or a neoplasia is the most common cause of inflammation of the appendix [2]. The luminal distension, which can develop due to this, constricts the perfusion of the appendix wall and leads to ischemia, which in turn can lead to a bacterial invasion with subsequent infection. A delayed surgical intervention of this condition can result in perforation of the appendix, proportionally increasing the risk between the time of diagnosis and the beginning of actual treatment. An appendectomy is usually the preferred therapy [3].

Postoperative complications are usually wound infections, postoperative hemorrhages, intra-abdominal abscess formations, adhesions, and very seldom *stump appendicitis* [4]. Since stump appendicitis is very uncommon, it is very often not immediately correctly diagnosed with right-sided lower abdominal pain after appendectomy, even though the clinical characteristics are similar to that of appendicitis. Indication of stump appendicitis is an infection of the remaining tissue of the supposedly completely removed appendix. This rare late complication after an appendectomy was already described the first time in 1945 by T.F. Rose [5]. Stump appendicitis can occur up to 50 years after the initial appendectomy [6], which most certainly complicates an accurate diagnosis.

Appendectomies are usually performed with open or minimal-invasive laparoscopic technique. Both techniques

are established procedures, which are applied in case of acute appendicitis. The first laparoscopic appendectomy was performed on September 13th, 1983, by the German Gynecologist K. Semm from the Universitätsfrauenklinik in Kiel, Germany [7]. Stump appendicitis was discovered due to advancements in laparoscopic appendectomy, and was associated with the length of the remaining stump [8]. Whilst Walsh *et al.* [9] reported on a possible increased risk of stump appendicitis after the laparoscopic technique, in which the stump is generally not lowered into the base of the caecum, its occurrence after both surgical techniques was however described similarly in the literature, so that the exact etiology has not as yet been completely explained [6, 10].

We herein report of a patient who had stump appendicitis eight weeks after laparoscopic appendectomy. We researched the Medline literature with regard to the occurrence of stump appendicitis after appendectomy, and compared the techniques to our technique (open vs. laparoscopic).

CASE REPORT

A 46 year old patient was admitted to our surgical emergency ward with severe abdominal pain, which he had for approximately the last 24 hours, as well as nausea, vomiting and subfebrile temperature. Eight weeks before the patient had a laparoscopic appendectomy due to acute appendicitis. The present symptoms were similar to those before the appendectomy. During the physical examination the patient was sensitive towards pressure in the right hypogastrum (McBurney and Lanz positive, leucocytes 16.02 /nl).

Abdominal X-ray was without pathological findings and sonography also showed nothing notable due to bowel obstructions in the region of the abdominal pain. A computed tomography finally revealed stump appendicitis with circular wall thickening at the coecal pole and inflammatory imbibition of the surrounding tissue (Fig. 1).

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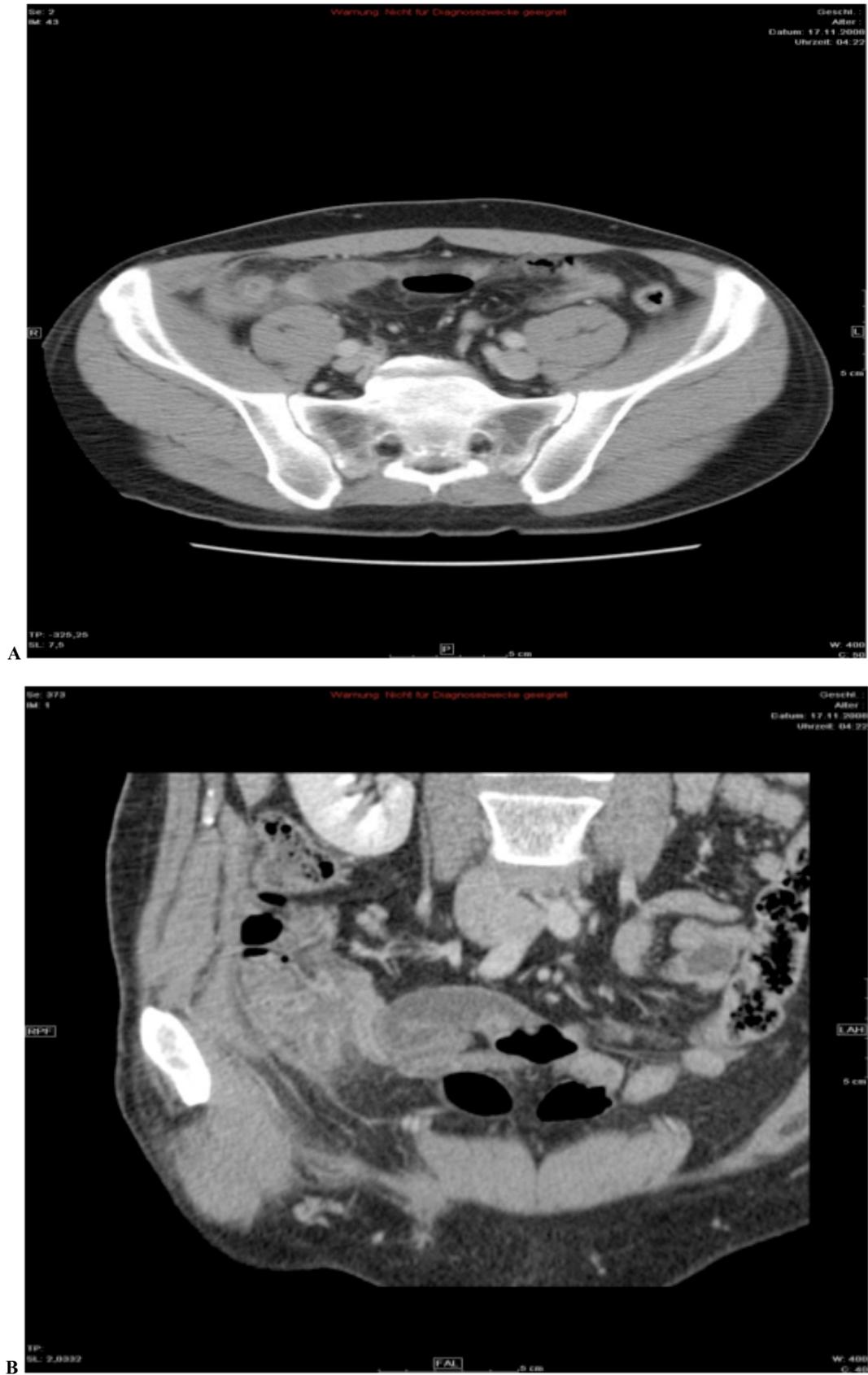


Fig. (1) A,B: CT-scan of the abdomen with inflammatory changes of the appendix stump. Circular wall thickening at the coecal pole and inflammatory imbibition of the surrounding fatty tissue correspond with the image of stump appendicitis.

Table 1. Literature of the Stump Appendicitis Cases

Author	Year	Age		1st op	Δt (months)	L (cm)	Perforation	Fever (°C)	Leucocytes/nl	Diagnostic	Δt post op (days)
Patel [27]	2009	8	m	lap	5	n.a.	n.a.	n.a.	n.a.	CT+ Km	n.a.
Mentes [28]	2008	32	m	open	144	1.5	n.a.	37.8	14.7	X,US	4
Jacombs [29]	2008	25	m	open	120	4	no	no	17.2	CT	2
Al-Dabbagh [30]	2008	41	m	n.a.	14	4.5	n.a.	n.a.	10.4	US	10
Truty [2]	2008	32	m	open	12	3.5	n.a.	yes	n.a.	CT	2
Waseem [31]	2007	15	m	lap	24	0.6	n.a.	37.5	10.0	CT+ Km	3
Yigit [32]	2007	32	w	n.a.	144	1	n.a.	n.a.	14.7	US	4
Uludag [33]	2006	47	m	open	240	1	yes	8.4	11.7	US, CT	3
Liang [16]	2006	32	w	lap	5	4	n.a.	37.8	9.3	CT	2
Burt [34]	2005	27	m	open	240	n.a.	n.a.	n.a.	20	CT	n.a.
Roche-Nagle [35]	2005	35	m	n.a.	168	3.5	yes	38.3	17.3	CT	8
Shin [18]	2005	41	m	lap	2	6.5	n.a.	n.a.	13.4	CT+Km	8
Aschkenasy [8]	2005	27	m	open	249	2.2	n.a.	36.1	20.1	CT	1
De [36]	2004	26	w	open	12	2.5	n.a.	n.a.	13.3	X+Km	10
Watkins [10]	2004	62	w	lap	9	5.5	yes	37	12.4	CT	5
Levine [37]	2004	31	m	lap	n.a.	n.a.	n.a.	n.a.	n.a.	CT	n.a.
Durgun [38]	2003	68	w	open	8	3	yes	38.8	16.4	Lap	10
Marcoen [39]	2003	49	m	lap	6	4	n.a.	37.8	12.3	X,CT,US	7
		14	w	lap	12	5	n.a.	38	n.a.	X,CT,US	n.a.
Nahon [23]	2002	33	m	open	18	n.a.	n.a.	38	8.4	CT,Colo	n.a.
Mangi [6]	2000	43	w	open	480	0.5	yes	no	13	CT	n.a.
		64	m	open	n.a.	0.6	yes	no	n.a.	Lap	n.a.
		63	w	open	600	n.a.	yes	n.a.	18.8	Lap	n.a.
Baldisserotto [40]	2000	13	w	open	2	n.a.	yes	39	14	US	n.a.
Gupta [22]	2000	11	m	lap	12	4.5	yes	yes	20.3	CT	16
Rao [19]	1998	39	w	open.	408	1.6	yes	38	19.4	US,CT	6
Erzurum [20]	1997	11	w	open	8	3.5	yes	39.2	19	CT	5
Walsh [9]	1997	72	w	lap	5	2.5	n.a.	yes	n.a.	X	10
Demartines [41]	1996	32	w	open	120	n.a.	n.a.	n.a.	n.a.	Lap	n.a.
Milne [42]	1996	25	m	lap	18	3	yes	37.8	18	X	11
Filippi de la Palavesa [43]	1996	25	m	lap	24	n.a.	n.a.	yes	n.a.	US,CT	n.a.
Thomas [17]	1994	53	w	open	252	n.a.	yes	38.7	21	CT	8
Devereaux [15]	1994	49	m	lap	2	2	yes	n.a.	n.a.	Lap	14
Siegel [44]	1954	51	w	open	168	1.3	yes	39.4	27	X+Km	35
Rose [5]	1945	23	m	open	12	5.1	yes	n.a.	n.a.	n.a.	n.a.
		40	m	open	24	5.1	yes	n.a.	n.a.	n.a.	n.a.
Own case	2009	46	m	lap	2	5	no	yes	16	US, CT+KM, Lap	4

Legend: 1. Op: primary operation, L (cm): length of the appendix stump in cm, Δt: interval between the first appendicitis and the stump appendicitis, Δt post Op: postoperative hospital stay, n.a: not specified, lap: laparoscopic, X: X-rays of abdomen, Km: contrast medium, Colo: colonoscopy, US: sonography of abdomen, CT: computed tomography of abdomen

A reoperation in laparoscopic technique was performed, which showed a local fibrinogenous infection in the right abdomen. The local adhesions of the greater omentum were separated, revealing an approximately 5 cm long appendix stump, which was ballooned at the distal end, and which discharge a murky liquid secretion when touched with a soft pair of pliers. It was noticed that a PDS loop was used to remove the appendix. The appendix stump was normal in the region of the caecum. By carefully dissecting and detaching the adherent fatty tissue, it was possible to mobilize the appendix stump. Thereafter the appendix stump was removed from the base of the caecum with an Endo-GIA (Fa. Ethicon, Norderstedt, Germany). The histological examination of the resected specimen revealed a mucous membrane of the colon with a chronic granulated and fibrinous purulent serositis reaching well into the submucosa, however without any signs of a dysplasia or malignancy. On the 4th postoperative day the patient was dismissed without any surgical complications.

DISCUSSION

Currently surgical resection is the standard treatment option for acute appendicitis. Since laparoscopic appendectomy was first described in 1983 [7], this technique is, apart from the open appendectomy, used more often nowadays. The main concern during the development of these two techniques was the management of the appendix stump after resection. Some studies have shown that with a simple ligature the development of intramural abscesses, invaginations and adhesions can be prevented [11, 12], whereas some say that lowering the stump would minimize the contamination of the abdomen, the development of adhesions and the risk of secondary hemorrhage [13]. Open appendectomy is usually performed by lowering the appendix stump, however with the laparoscopic version the appendix is removed and the stump is not lowered or sutured.

During the last 17 years laparoscopic appendectomy has proved itself to be a very safe method compared to the open technique, reducing the time of hospitalization, the use of painkillers and the occurrence of adhesive strangulation of the intestine. It has however been reported in the literature that the occurrence of stump appendicitis is associated to the more frequently used laparoscopic technique [9, 14, 15], although most cases of stump appendicitis are reported after open appendectomy [10, 16]. In fact, 55% of the cases occurred after open appendectomy, as shown in our Medline literature of 35 cases (Table 1).

An important prerequisite for the prevention of stump appendicitis is the complete resection of the appendix during the primary operation. Several authors have actually associated the occurrence of stump appendicitis to the length of the remaining appendix stump [17-21]. Our literature analysis of 35 patients with stump appendicitis showed, that after laparoscopic intervention the remaining appendix stump with an average length of 3.9 cm, was statistically significantly ($p=0.48$) longer than after open appendectomies (2.6 cm). This underlines that the preparation of the caecum base demands a lot of attention during an appendectomy (Table 2).

Table 2. Comparison of Characteristics of Patients with Stump Appendicitis after Open or Laparoscopic Appendectomy

	Open	Lap.	p
Age (years)	38.82±3.0	34.29±5.2	0.428
Time between primary and secondary operation (months)	163.86±36.6	9.69±2.2	0.000
Stump length (cm) of the remaining appendix	2.582±0.37	3.873±0.52	0.048
Leucocytes (amount/nl)	16.6±11.0	13.9±13.6	0.168
Duration of hospital stay after reoperation (days)	7.71±2.3	8.44±1.6	0.817

The most common reason for an incomplete appendix removal is the not always easily identifiable caecum base. This can be prevented if the appendicular artery is dissected and ligated, since it marks the base of the caecum [22]. A further technique identifying the correct resection margin is to follow the colic taeniae right up to the appendix [23, 24]. Laparoscopic appendectomy can due it's restricted vision, the unavailable three-dimensionality, the limited palpation possibility as well as the careful preparation of the caecum base with the diathermy instruments, possibly benefit the development of stump appendicitis [9, 25, 26]. Surgical conditions can, apart from various other reasons, become complicated due to inflammatory changes of the surrounding tissue. It should be the aim in each case to perform a complete resection of the appendix, should this however not be possible with the laparoscopic method, then it should be done with the open technique.

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