NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

INTERVENTIONAL PROCEDURES PROGRAMME

Interventional procedure overview of endoscopic ablation for an anal fistula

An anal fistula is a narrow tunnel that forms between the end of the bowel and the skin near the anus. It may cause pain or discomfort, and leak blood or pus. In this procedure, an endoscope (a thin flexible tube with a camera on the end) is put into the fistula. An electrode is passed through the endoscope to deliver heat, which seals the tissues inside the fistula. Stitches are used to close the end of the fistula that is nearest to the bowel. The aim is to encourage healing.

Contents

Introduction

The National Institute for Health and Care Excellence (NICE) prepared this interventional procedure overview to help members of the interventional

procedures advisory committee (IPAC) make recommendations about the safety and efficacy of an interventional procedure. It is based on a rapid review of the medical literature and specialist opinion. It should not be regarded as a definitive assessment of the procedure.

Date prepared

This overview was prepared in October 2018 and updated in December 2018.

Procedure name

- Endoscopic ablation for an anal fistula

Specialist societies

- Association of Coloproctology of Great Britain and Ireland
- Royal College of Surgeons

Description of the procedure

Indications and current treatment

An anal fistula is an abnormal tract between the anal canal and the skin around the anus. It may cause symptoms such as pain or discomfort, and leak blood or pus. It usually results from previous anal abscesses (cryptoglandular), and can be associated with other conditions including inflammatory bowel disease (such as Crohn's disease) and cancer.

Anal fistulas can be classified according to their relationship with the external sphincter. A fistula may be complex, with several openings onto the perianal skin. Intersphincteric fistulas are the most common type and cross only the internal anal sphincter. Trans-sphincteric fistulas pass through both the internal and external sphincters.

Treatment of an anal fistula commonly involves surgery. The type of surgery depends on the medical history, extent, location and complexity of the fistula in relation to surrounding muscles. The aim is to drain infected material and encourage healing. If the fistula does not heal completely another surgical procedure may be needed. For simple intersphincteric and low trans-sphincteric anal fistulas, the most common treatment is a fistulotomy or laying open of the fistula tract (involving muscle division that may affect continence). For high and complex (deeper) fistulas that involve more muscle, with a high risk of faecal incontinence or recurrence, surgery aims to treat the fistula and preserve

sphincter-muscle function. Techniques include a 1-stage and 2-stage seton (suture material or rubber sling) either alone or in combination with fistulotomy, ligation of an intersphincteric fistula tract, creating a mucosal advancement flap, injecting glue or paste, or inserting a fistula plug.

What the procedure involves

Endoscopic ablation of an anal fistula is a less invasive procedure than surgery. It aims to preserve sphincter muscle function and faecal continence. It may be done in combination with surgical techniques such as creating a mucosal advancement flap.

The procedure is usually done as a day case using spinal or general anaesthesia. With the patient in the lithotomy position a fistuloscope is inserted into the fistula tract from the external opening. A continuous jet of irrigation solution is used, which allows optimal visualisation of the fistula tract, the internal opening and any secondary tracts or abscess cavities. When the fistuloscope exits through the internal opening to the rectal mucosa, 2 or 3 stitches are inserted to isolate the internal opening. Under direct vision an electrode is passed through the fistuloscope and the material in the fistula tract is cauterised from the external to the internal opening. All necrotic material is removed using a fistula brush and a continuous jet of irrigation solution. The fistuloscope is removed and the internal opening closed by suturing, stapling or by creating a cutaneous mucosal flap.

Efficacy summary

Success rate (complete clinical healing of fistula in the anal tract)

A systematic review of 8 case series (with 786 patients) on video-assisted anal fistula treatment (VAAFT) for treating cryptoglandular fistula-in-ano (simple or complex and recurrent fistulas) reported that the success rate in fistula healing ranged from 53% to 93% in the included studies. The overall pooled success rate was 76% (95% confidence interval 68% to 84%, I^2=82%)[2].

In a systematic review on novel sphincter sparing techniques for management of anal fistula, 12 studies (with 917 patients) on VAAFT for idiopathic or Crohn's related anal fistula reported that success rates (clinical healing rates) varied from 67% (12/18, after an average follow-up of 10 months) to 100% (40/40, at 3 months follow-up). One included large case series (n=416) reported a success rate of 74% (99/134) at 1 year follow-up. Another retrospective case series (n=203) reported that the 6 month cumulative probability of freedom from fistula estimated according to Kaplan-Meier analysis was 74% (95% confidence interval [CI] 64% to 76%)[3].

A retrospective case series of 224 patients with complex perianal fistula treated with VAAFT reported a primary healing rate of 77% (40/52) in patients with primary disease and 64% (110/172) in patients with recurrent complex fistula at 3 months follow-up (with no statistical significance between the groups p=0.1). The overall healing rate at 12 months follow-up was 92% (48/52) in patients with primary complex fistula and 80% (138/172) in the recurrent complex fistula group, with no statistically significant difference between primary and recurrent fistula groups (p=0.06)[4].

A case series of 78 patients with perianal fistulas (mainly with recurrent disease and previous surgical interventions) treated with VAAFT reported that at a median follow-up of 14 months, 81% (60/74) of patients were asymptomatic (cured) and 19% (14/74) were still symptomatic. A subgroup analysis comparing the outcome to the number of prior surgical interventions before VAAFT with those patients who had VAAFT as the primary procedure showed that those who had previous surgeries (mostly seton placement) did not have a better healing rate (p=0.805)[5].

A case series of 68 patients with perianal fistulas (30 simple and 38 complex fistulas) treated with VAAFT reported that the overall success rate was 54% (37/68) at a mean follow-up of 31 months. The difference in the overall success rates between the simple fistula group and the complex fistula group was statistically significant (73% [22/30] compared with 39% [15/38], p=0.011). Women in the case series had higher healing rates for both simple (82% compared with 68%, p=not significant) and complex fistulas (77% compared with 27%, p=0.016) compared with men. Persistent fistula after primary VAAFT (needing secondary procedures such as repeated VAAFT, fistulectomy or seton placement) were reported in 20% (6/30) of patients with simple fistulas and 29% (11/38) patients with complex fistulas[6].

Recurrence rates

A systematic review of 11 studies on VAAFT for fistula-in-ano (788 patients with mainly cryptoglandular fistulas, 66% with high or complex fistulas, and 18% with previous fistula surgery) reported that recurrence occurred in 14% (112/788) of patients after a median follow-up of 9 months (range 3.2 to 34 months). The weighted mean recurrence rate across studies was 18% (95% CI 12% to 24%, I^2=69%, p=<0.001). The median recurrence rate across studies was 16% (range 8% to 33%). Recurrence rates varied according to the method of closure of internal opening from 15% (69/449) after using staplers, 18% (20/113) after suturing, to 25% (7/28) after using advancement flap. Recurrence rates in 3 studies that used sealants ranged from 15% to 27%. Recurrences were reported in all 3 patients in whom the internal opening was left open. Variables that were significantly associated with post-operative recurrence were male

gender (SE=-0.022, p<0.01), previous fistula surgery (SE=0.029, p=0.005) and using flaps for internal opening closure (SE=0.054, p=0.021)[1].

In the case series of 224 patients with complex perianal fistulas, disease recurrence was reported in 23% (12/52) of patients with primary complex fistula. All complex perianal fistulas were retreated with VAAFT including abscess drainage in 6 patients and all healed within 2 months. In the recurrent complex fistula group, disease recurrence was reported in 32% (56/172) of patients. 36 patients (with secondary/horseshoe tracts) underwent VAAFT surgery, 8 had abscess drainage and in 12 fistulectomy was performed with enucleation of residual abscess cavity. 14 of these patients were disease free between 8 to 12 months. 6 patients with delayed wound healing had local excision with complete healing in 2 months. No recurrences were observed at 2 years and at 5 years follow-up (n=13)[4].

In the case series of 68 patients with perianal fistulas (30 simple and 38 complex fistulas) treated with VAAFT, recurrence (between 1 and 6 months after healing) was reported in 7% (2/30) of patients with simple fistulas and 32% (12/38) of patients with complex perianal fistulas[6].

Detection of internal opening

In the systematic review of 11 studies, the internal opening was detected successfully in 86% (676/788) of patients. The weighted mean rate of detection of the internal opening was 93% (95% CI 89% to 98%, I^2=92%, p<0.001). The location of the internal opening disclosed in 6 studies (n=607) shows that it was located at the dentate line in 83% (501/607) patients, in the anal canal in 10% (59/607) of patients and high up in the rectum in 8% (47/607) of patients[1].

In the systematic review of 8 studies (786 patients) on VAAFT for treating cryptoglandular fistula-in-ano (simple or complex and recurrent), the internal opening was not accurately found in 63% of patients in 5 studies[2].

Quality of life

In a case series of 25 patients with complex Crohn's fistula treated with VAAFT, 84% (21/25) of patients reported significant improvement in both pain and discharge scores (p<0.001) (assessed using a generic 'your medical outcome profile' [MYMOP] quality of life questionnaire and rating symptoms on a scale of 1 to 6 both pre and post-operatively at 6 weeks follow-up). 81% of patients who completed the questionnaire agreed or strongly agreed that it was the right decision and no patient regretted undergoing the procedure. A validated self-reported decision regret scale (DRS) was used to measure the decision to have surgery[7].

Operation time and hospital stay

In the systematic review of 11 studies, the mean operation time was 42±14.2 minutes (range 22 to 67 minutes). All studies used VAAFT as a day case surgery expect 2 studies in which the mean hospital stay was 3 and 4 days respectively[1].

In the systematic review of 8 studies (with 786 patients) on VAAFT for treating cryptoglandular fistula-in-ano (simple or complex), the mean operating time ranged from 15 to 53 minutes and the net pooled rate was 44.7 minutes (95% CI 38.3 to 51.2). The mean hospital stay ranged from 1.02 to 4.1 days in 4 studies[2].

In the systematic review on novel sphincter sparing techniques for management of anal fistula, 12 studies (with 917 patients) on VAAFT for idiopathic or Crohn's related anal fistula reported that operating time varied from 18 to 135 minutes[3].

In the case series of 224 patients, the median operative time was 45 minutes (range 20 to 60 minutes). Median length of stay was 23 hours (range 12 to 36 hours). 76% (171/224) patients had fistulas treated in a day surgery, 22% (50/224) stayed for 1 day and 1% (3/224) with multiple comorbidities stayed for 2 days[4].

In the case series of 68 patients with perianal fistulas treated with VAAFT the mean operating time was 65 minutes (range 20 to 135 minutes). There was a correlation with a drop in operating time and the learning curve[6].

Return to work

In the systematic review of 8 case series (with 786 patients) on VAAFT for treating cryptoglandular fistula-in-ano (simple or complex), the time taken to return to normal work by patients ranged from 1 to 11 days in 4 studies[2].

In the case series of 224 patients, all patients were able to resume daily activities within a median of 7 days from surgery (range 2 to 12 days)[4].

Safety summary

Complication rates

In the systematic review of 11 studies (with 788 patients) on VAAFT for fistula-in-ano, the weighted mean complication rate was 5% (95% CI 2% to 8%, I^2=78%, p<0.001). The median rate of complications was ranging from 0% to 18%. 8% (59/788) developed grade I/II complications and creation of false tract and oedema were the most common complication after VAAFT in 4% (30/788) of patients[1].

In the systematic review of 8 case series (with 786 patients) on VAAFT for treating cryptoglandular fistula-in-ano (simple or complex) the complication rate

ranged from 0% to 16% and the overall pooled complication rate was 16% (95% CI 12% to 20%, I^2=81%). Most of the complications were infection [n=1], discharge (serous [n=20], bloody [n=6], pus [n=9]), itching (n=17), bleeding (n=1), allergy to glue (n=1), scrotal oedema (n=1), headache related to anaesthesia (n=1), post-puncture syndrome after spinal anaesthesia (n=1) and urine retention (n=1)[2].

In the systematic review on novel sphincter sparing techniques for management of anal fistula, 12 studies (with 917 patients) on VAAFT for idiopathic or Crohn's related anal fistula reported complications in 5% (52/917) patients. Most of the complications were perineal oedema caused by infiltration of irrigation solution after rupture of the fistula wall (n=29), scrotal oedema (n=1), post-puncture syndrome after spinal anaesthesia (n=1), allergy to glue (n=2), headache related to anaesthesia (n=1), rectal bleeding (n=8), bloody discharge from fistula tract (n=2), perianal sepsis treated with seton placement (n=3) and urinary retention (n=5)[3].

Perianal and gluteal oedema (caused by infiltration of the irrigation solution in the ischio-rectal space) was reported in 5% (12/224) patients in the case series of 224 patients. This resolved spontaneously within 12 to 24 hours and did not need any treatment[4].

Pain

In the systematic review of 11 studies, 3 studies measured post-operative pain the first day after surgery using visual analogue scale (VAS) ranging from 0 to 10. The median VAS was 4 ranging from 3.1 to 4.5[1].

Very low pain was reported at discharge by all patients (median visual analogue scale 2, range 1 to 4) in the case series of 224 patients with primary and recurrent complex anal fistula treated with VAAFT. 15% (33/224) patients needed post-operative analgesics for 3 to 4 days. At first follow-up (7 days) none of the patients reported any pain[4].

Severe headache (associated with spinal analgesia) was reported in 1 patient in the case series of 68 patients with perianal fistulas treated with VAAFT. Symptoms resolved after treatment with painkillers[6].

Pain and swelling was reported in 1 patient in the case series of 25 patients with perianal fistulas treated with VAAFT. The patient was admitted to hospital but no abscess was found[7].

Incontinence rate

In the systematic review of 8 studies (with 786 patients) on VAAFT for treating cryptoglandular fistula-in-ano (simple or complex), 6 studies reported no significant deterioration/worsening of continence levels after the procedure[2].

In the systematic review on novel sphincter sparing techniques for management of anal fistula, 12 studies (with 917 patients) on VAAFT for idiopathic or Crohn's related anal fistula reported no significant deterioration of continence levels across studies where assessed. One study that used pre and post-operative anal manometry as an objective assessment of sphincter function reported no significant difference in mean resting anal or squeeze pressures[3].

In the case series of 224 patients with primary and recurrent complex anal fistula, no patients complained impairment of sphincter function or incontinence, with a median post-operative Wexner score of 0 (range 0 to 3) at a median follow-up of 48 months[4].

Device-related damage

A damaged cautery probe which left a severed metal electrode tip in the wound was reported in 1 patient in the case series of 68 patients with fistulas treated with VAAFT. The metal tip was successfully recovered with forceps during the procedure[6].

Anecdotal and theoretical adverse events

In addition to safety outcomes reported in the literature, specialist advisers are asked about anecdotal adverse events (events which they have heard about) and about theoretical adverse events (events which they think might possibly occur, even if they have never happened). For this procedure, specialist advisers listed the following anecdotal adverse event: infection. They considered no theoretical adverse events.

The evidence assessed

Rapid review of literature

The medical literature was searched to identify studies and reviews relevant to Endoscopic ablation for an anal fistula. The following databases were searched, covering the period from their start to 28.12.2018: MEDLINE, PREMEDLINE, EMBASE, Cochrane Library and other databases. Trial registries and the Internet were also searched. No language restriction was applied to the searches (see the literature search strategy). Relevant published studies identified during consultation or resolution that are published after this date may also be considered for inclusion.

The following selection criteria (table 1) were applied to the abstracts identified by the literature search. Where selection criteria could not be determined from the abstracts the full paper was retrieved.

Table 1 Inclusion criteria for identification of relevant studies

Characteristic	Criteria
Publication type	Clinical studies were included. Emphasis was placed on identifying good quality studies. Abstracts were excluded where no clinical outcomes were reported, or where the paper was a review, editorial, or a laboratory or animal study. Conference abstracts were also excluded because of the difficulty of appraising study methodology, unless they reported specific adverse events that were not available in the published literature.
Patient	Patients with anal fistula.
Intervention/test	Endoscopic ablation or video-assisted anal fistula treatment (VAAFT).
Outcome	Articles were retrieved if the abstract contained information relevant to the safety and/or efficacy.
Language	Non-English-language articles were excluded unless they were thought to add substantively to the English-language evidence base.

List of studies included in the IP overview

This IP overview is based on 1424 patients from 3 systematic reviews[1-3] and 4 case series[4-7]. There is an overlap between the studies included in the systematic reviews.

Other studies that were considered to be relevant to the procedure but were not included in the main extraction table (table 2) are listed in the appendix.

Table 2 Summary of key efficacy and safety findings on Endoscopic ablation for an anal fistula

Study 1 Emile SH (2018)

Details

Study type	**Systematic review and meta-analysis**
Country	6 in Asian countries, 4 in Europe, and 1 in Brazil (between 2011-17).
Study period	Search period: inception to April 2017; Databases searched; Medline, Pub-Med and Scopus; bibliography of included articles also searched
Study population and number	n=**11 case series or cohort studies (n=788 patients with fistula-in-ano [FIA]) (6 prospective and 5 retrospective analyses)** Cryptoglandular fistula mainly (except in one study in which all patients had anal fistula secondary to Crohn's disease). 66.5% (524/788) had high or complex FIA, 33.5% (264/788) low anal fistulae 18.4% (145/788) had recurrent FIA after previous fistula surgery.
Age and sex	Mean age 39.5 years (range 9.6 to 52.1 years); male 3.6:1
Study selection criteria	Studies (both comparative and cohort) reporting outcomes of VAAFT procedure for anal fistula were included. No language restrictions applied. Excluded reviews, meta-analyses, case reports, editorials, letters, articles with less than five patients and those that did not report recurrence and complication rates.
Technique	All procedures done using video-assisted anal fistula treatment (VAAFT) instruments (Karl Stroz GmbH) as a day case surgery. 607 patients from 6 studies reported the location of internal opening (dental line in 501 patients, anal canal in 59 patients and high up in the rectum in 47 patients). Secondary fistula branches were seen in 25.3% (90/355) patients from 8 studies. According to Park's classification there were 46.8% (316/788) transsphincteric fistulae, 30.8% (208/788) intersphincteric fistulae, 17.6% (119/788) suprasphincteric fistula and 4.7% (32/788) extrasphincteric fistulae. Glycine mannitol solution was mainly used for irrigation of the fistula tract. Same technique was used for fulguration and debridement of the fistula tract. Various methods have been used for closure of the internal opening of the fistula (2 used endostaplers [n=449], 2 used sutures [n=113] and 1 used advancement flaps [n=28] and 6 studies used two or more of these methods). Internal opening was not closed in 3 patients. Injection of sealants (fibrin glue or cyanoacrylate injection) was used in 5 studies.
Follow-up	**Varied across studies**
Conflict of interest/source of funding	4 authors declare no conflicts of interest or financial support.

Analysis

Follow-up issues: short follow-up in many studies.

Study design issues: systematic review was registered with the prospective register of systematic reviews (PROSPERO) and conducted in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines. The main outcomes were recurrence, and complication rates. 2 reviewers assessed the quality of studies (using the case series checklist of NICE) and any disagreements were resolved after consulting a third reviewer. Quality of each study was given a score and defined as good (score 7-8), fair (4-6) and poor (0-3). 8 studies were of fair quality and 3 were of good quality (median score was 5). Meta-analysis was conducted using openMeta version 12.11.14. Statistical heterogeneity was observed among the studies.

One study was excluded from the analysis of the method of closure as it did not specify the number of patients and the method of closure used.

Study population issues: studies were mainly small case series or cohort studies. More than half of the patients were from 1 study included in the analysis.

Other issues: There is an overlap between the studies included in the systematic reviews.

Key efficacy and safety findings

Efficacy

Number of patients analysed: **788**

Procedural outcomes

Detection of the internal opening of the fistula % (n)	85.7 (676/788)
Weighted mean rate of detection of the internal opening	93.3% (CI 88.8-97.8%, I^2=92.1, p<0.001)
Mean operation time (minutes)	42±14.2 (range 22 -67)
Mean hospital stay (days)	3 or 4 (only in 2 studies)

Mean recurrence rates across studies (median follow-up 9 months [range 3.2 to 34 months])

Studies	Recurrence rate	95% CI	Event/treatment (n)
Jiang 2017	0.154	0.056, 0.252	8/52
Seow-En 2016	0.293	0.153, 0.432	12/41
Pin-Prato 2016	0.333	0.025, 0.641	3/9
Chowbey 2015	0.084	0.057, 0.111	35/416
Liu 2015	0.273	0.010, 0.536	3/11
Zarin 2015	0.075	0.000, 0.157	3/40
Mendes 2014	0.125	0.000, 0.354	1/8
Kochhar 2014	0.159	0.079, 0.238	13/82
Walega 2014	0.333	0.116, 0.551	6/18
Schwander 2013	0.154	0.000, 0.350	2/13
Meinero & Mori 2011	0.265	0.178, 0.353	26/98
Overall	**0.177 I^2=69.49%, p<0.001**	**0.118, 0.237**	**14.2% (112/788)**

The median recurrence rate across studies was 15.8% (range 7.5% to 33.3%).

Safety

Complication rates across studies

Studies	Recurrence rate	95% CI	Event/treatment (n)
Jiang 2017	0.288	0.165, 0.412	15/52
Seow-En 2016	0.012	0.000, 0.045	0/41
Pin-Prato 2016	0.050	0.000, 0.185	0/9
Chowbey 2015	0.094	0.066, 0.122	39/416
Liu 2015	0.182	0.000, 0.410	2/11
Zarin 2015	0.012	0.000, 0.046	0/40
Mendes 2014	0.056	0.000, 0.205	0/8
Kochhar 2014	0.006	0.000, 0.023	0/82
Walega 2014	0.026	0.000, 0.098	0/18
Schwander 2013	0.036	0.000, 0.133	0/13
Meinero & Mori 2011	0.031	0.000, 0.065	3/98
Overall	**0.048 I^2=79.53%, p<0.001**	**0.015, 0.080**	**59/788**

Median rate of complications was 0 (ranging from 0 to 18.3%)

Complications of VAAFT

Study	Complications % (n)	Type of events
Jiang 2017	28.8 (15/52)	Perineal sepsis 3, bleeding 3, intolerable pain 6
Seow-En 2016	0	-
Pin-Prato 2016	0	-
Chowbey 2015	9.3 (39/416)	Urine retention 6, false tract and perineal edema 29, bleeding per rectum 5, bloody discharge 2, bleeding 1, fever and infection1

Recurrence rate with method of closure

Recurrence with method of closure of internal opening	% (n)
After using staplers	15.3 (69/449)
After using sutures	17.7 (20/113)
After using advancement flaps	25 (7/28)
Left open	100 (3/3)

Recurrence rates in studies that used sealants ranged from 15.3 to 27.2%.

Redo of VAAFT: Redo of the VAAFT was done in 58% of recurrences.

Variables that are significantly associated with recurrence of FIA after VAAFT were male gender (SE=-0.022, p<0.01), previous fistula surgery (SE=0.029, p=0.005) and using flaps for closure of internal opening (SE=0.054, p=0.021).

Liu 2015	18.1 (2/11)	Bleeding 1, fever and infection 1
Zarin 2015	0	-
Mendes 2014	0	-
Kochhar 2014	0	-
Walega 2014	0	-
Schwander 2013	0	-
Meinero & Mori 2011	3 (3/98)	Urine retention 2, scrotal edema due to dye extravasation 1
Overall	7.5 (59/788)	

All events were grade I/II on Clavien-Dindo scale of complications. Oedema was the most common complication 3.8% (30/788)

Study 2 Garg P (2017)

Details

Study type	Systematic review and meta-analysis
Country	
Study period	2010-2016; databases searched: PubMed, Medline, Scopus, Embase, Ovid, SCI database, Cochrane central register of controlled trials 9CENTRAL) and Google Scholar database.
Study population and number	n=**8 studies (786 patients with cryptoglandular fistula-in-ano who had VAAFT)** 4 retrospective studies, 4 prospective studies. Fistulae were mainly high and complex and few simple ones. In some cases recurrent.
Age and sex	Mean age range 35 to 47 years; male to female ratio 3:2.1
Patient selection criteria	All studies in which VAAFT was used to treat cryptoglandular fistula were included (including non-English studies). Studies of procedures done in patients with Crohn's fistula-in-ano, paediatric patients with fistula-in-ano and patients of fistula-in-ano associated with malignancy, tuberculosis, pelvic radiotherapy or existing incontinence were excluded from the study.
Technique	VAAFT under spinal or general anaesthesia. Internal opening was not accurately found in 62.5% patients.in these cases the opening was found using a fistuloscope light behind the rectal mucosa. Different methods were used to close the internal opening in studies (endo stapler in 4 studies, mattress suture in 6 studies and an advancement flap in 2 studies). In one study Fibrin glue was also used after stapling.
Follow-up	**Varied in studies (mean 1 to 15 months)**
Conflict of interest/source of funding	No conflicts of interest.

Analysis

Follow-up issues: follow-up was short and varied in studies.

Study design issues: study was registered at review registry; data was extracted by 2 reviewers and any disagreement was resolved after discussion and consensus between them. The PRISMA methods were adhered to while doing the systematic review and meta-analysis. The primary outcomes were success rate in fistula healing and secondary outcomes were operating time, hospital stay, return to work, complication and incontinence rates. Stats-Direct statistical software was used for the analysis. Quality assessment of studies was assessed using Newcastle-Ottawa method.

Study population issues: only procedure done in adult patients with cryptoglandular anal fistulae were analysed. Ha1f of the patients in the analysis were from 1 study.

Other issues: There is an overlap between the studies included in the systematic reviews.

Key efficacy and safety findings

Efficacy

Number of patients analysed: **786**

Success rate (defined as complete clinical healing of fistula in the anal tract, and all tracts closed)

The pooled success rate was 76.01% (95% CI 68.1 to 83.9%, I^2=82.4%). Rates ranged from 52.5 to 92.5%.

Healing/cure rate

Study	Healing rate % (n)
Liu 2015	72.7 (8/11)
Chowbey 2015	73.8 (99/135)
Mendes 2014	87.5 (7/8)
Walega 2014	66.67 (12/18)
Zarin 2015	92.5 (37/400)
Selvarajan 2015	52.5 95/80
Kochhar 2015	84.2 (69/82)
Meinero 2014	70 (118/169)

Procedural outcomes

Pooled operating time (minutes)	44.7 (95%CI 38.3 to 51.2)
Operating time (minutes)	range 15 to 53
Hospital stay (days, reported in 4 studies)	range 1.02 to 4.1

Return to work: the days to return to normal work was reported in 4 studies and ranged from 1 to 11 days.

Incontinence rate (reported in 6 studies, and only 2 studies used validated scales)
No study reported any significant deterioration in continence levels as compared to pre-operational levels.

Safety

Complication rates

The pooled complication rate was 16.2% (95%CI 12.1 to 20.2%, I^2=81.1%). Rates ranged from 0 to 16%.

Complications

Study	No of patients	Complications
Liu 2015	11	Infection =1 Bleeding =1
Chowbey 2015	416	Serous discharge =20 Pus discharge =9 Bloody discharge =6
Mendes 2014	8	0
Walega 2014	18	Post spinal syndrome=1
Zarin 2015	40	Itching and discharge for 12 weeks =17
Selvarajan 2015	8	-
Kochhar 2014	82	-
Meinero 2014	203	Urine retention=1 Allergy to glue=1 Scrotal oedema=1 Headache=1

Abbreviations used: CI, confidence interval; VAAFT, video-assisted anal fistula treatment;

Study 3 Adegbola SO (2017)

Details

Study type	**Systematic review**
Country	6 in Asian countries, 5 in Europe, and 1 in Brazil.
Study period	Search period: 2006 to April 2017; Major databases searched: Medline, Embase; bibliography of included articles were also searched.
Study population and number	n=**12 VAAFT prospective case series (n=917 patients with idiopathic or Crohn's related fistula)** Crohn's disease in 2% (21/917) patients.
Age and sex	Mean age range (9.6 to 48 years); Sex not reported
Patient selection criteria	All published articles in English on patients with idiopathic or Crohn's related fistula undergoing VAAFT were included. Excluded case reports, conference abstracts and review articles. Retro-vaginal fistula were excluded from the analysis.
Technique	All procedures done using VAAFT instruments (Karl Stroz GmbH) as a day case surgery. Closure of internal opening was done by various techniques (suturing, stapling, and advancement flaps).
Follow-up	**Varied across studies (ranged from 6 to 69 months)**
Conflict of interest/source of funding	Authors declare no conflicts of interest.

Analysis

Follow-up issues: follow-up varied and relatively short term follow-up (<1 year) in many studies.

Study design issues: systematic review on three novel anal sphincter sparing techniques (VAAFT, fistula tract laser closure [FilaC]) and over the scope clip (OTSC) reporting fistula healing and safety. Study done according to preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement. Two reviewers undertook searches, selected studies, extracted data and analysed data on the outcomes (healing rates and complications). Healing rates in studies were assessed on a clinical basis without radiological assessment.

Study population issues: studies were mainly small case series. More than half of the patients were from 1 study included in the analysis. 1 study included children. There is significant heterogeneity in study populations (fistula morphology and aetiology).

Other issues: evidence on 2 other techniques FiLaC (using a radial emitting laser probe) and OTSC (proctology clip system) were not considered as it is out of the scope of this review.

There is an overlap between the studies included in the systematic reviews.

Key efficacy and safety findings

Efficacy

Number of patients analysed: **917**

Operating time varied from 18 to 135 minutes.

Success rates (clinical healing) varied from 67 to 100%.

Study	n	Operation time (minutes)	Success rate % (n)
Schwander 2013	10	22 (18-42)	81 (9/10)
Kochhar 2014	82	45 (30-90)	84 (69/82)
Meinero 2014	203	90 (60-120)	74**
Mendes 2014	8	31.7 (18-45)	88 (7/8)
Walega 2014	18	67 (45-135)	67 (12/18)
Grolich 2014	30	NR	NR
Zarin 2015	40	NR	100 (40/40)*
Selvarajan 2015	8	NR	NR
Chowbey 2015	416	50 (22-94)	73.8 (99/134)^
Pini Prato 2016	9	38 (25-60)	67 (6/9)
Seow-En 2016	41	NR	71 (29/41)
Jiang 2017	52	55 (35-90)	85 (44/52)

*at 3 months; ** cumulative probability of freedom from fistula at 1 year(according to Kaplan-Meier analysis); ^at 1 year;

Safety

Complication rates across studies: 5% (52/917)

Study	Adverse event	n
Jiang 2017 (n=52)		
	Post-operative perineal sepsis (treated with cutting setons)	3
	Post-operative bleeding (secondary to laceration of rectal mucosa around the internal opening)	3
Meinero 2014 (n=203)		
	Post-operative urinary retention	5
	Allergy to synthetic cyanoacrylate	2
	Headache related to spinal anaesthesia (delayed discharge)	1
	Rectal bleeding (readmitted to hospital)	5
	Scrotal oedema	1
Chowbey 2015 (n=416)		
	Perineal oedema (caused by infiltration of irrigation solution after rupture of the fistula wall)	29
	Bloody discharge from the fistula tract (readmitted to hospital)	2
Walega 2014 (n=18)	Anaesthetic complication (delayed discharge due to post-puncture syndrome after spinal anaesthesia)	1

No reports of deaths, incontinence or surgical complications.

1 study assessed sphincter function (using anal manometry) and found no significant difference in resting tone or squeeze increments pre and post-surgery (Kochhar 2014).

Abbreviations used: VAAFT, video-assisted anal fistula treatment.

Study 4 Stazi A (2018)

Details

Study type	**Retrospective case series**
Country	Italy
Recruitment period	2011 to April 2014
Study population and number	n=**224 patients affected by complex perianal fistula (52 with primary and 172 with recurrent disease)** **Type of fistula:** trans-sphincteric 67% 9150/224), extra-sphincteric 6.2% (14/224), supra-sphincteric 7.1% (16/224), inter-sphincteric 4.5% (10/224), horseshoe 15.2% (34/224). **Location of internal opening:** at level of dentate line 59% (132/224), above dentate line 35% (78/224) and in the rectum 6% (14/224). **Pre-operative Wexner Score:** 1 (range 0-4)
Age and sex	Mean age 43.4 years; 70% (156/224) male.
Patient selection criteria	All patients with complex perianal fistulae and underwent VAAFT have been included in the study. Patients under 18 years old, affected by Crohn's disease and procedures undertaken in emergency setting have been excluded.
Technique	All patients had VAAFT by Karl Stroz GmbH under spinal anaesthesia by a single experienced colorectal surgeon after antibiotic administration. Glycine mannitol was used as irrigation solution. Internal opening of the fistula tract is closed using either semi-circular or linear stapler, or a mucosal flap. Cyanoacrylate was not used after stapling. The external orifice is widened to allow washing with saline and avoid early closure. 76% (171/224) patients had anal fistulas treated in day surgery, 22.3% (50/224) stayed in hospital for 1 day and 3 patients with multiple comorbidities stayed for 2 nights. Post-operative evaluation was done at planned intervals.
Follow-up	**Median 48 months (range 27 to 60 months)**
Conflict of interest/source of funding	Authors declare no conflicts of interest or financial support.

Analysis

Follow-up issues: both short and mid-term follow-up reported. All patients were followed for a minimum of 27 months. 23.6% (53/224) patients were lost to follow-up after 2 years and only 13 patients were available for follow-up at 5 years.

Study design issues: study was conducted in a referral and training centre for VAAFT by a single surgeon. Pain (using non-standardised VAS scale) and Wexner incontinence scores were evaluated before discharge. One year after VAAFT, transanal ultrasound was done to assess the fibrosis of fistula tracts burned during the procedure.

Study population issues: anal fistulae were classified as complex if a tract crossing more than one third of the longitudinal length of the anal sphincter, anterior fistula in women, recurrent fistula or pre-existing incontinence. Previous surgical treatments were done in 46% (24/52) patients with primary disease (stapled procedures for haemorrhoidal prolapse) and 96.5% (166/172) with recurrent disease (either fistulotomy, fistulectomy, or seton placement).

Key efficacy and safety findings

Efficacy

Number of patients analysed: **224**

Procedural outcomes

Operative time (minutes)	Median 45 (range 20-60)
Length of stay (hours)	Median 23 (range 12-36)
Closure of internal opening	**% (n)**
Stapling	55% (123/224)
Mucosal flap	45% (101/224)

Healing rates

Outcomes	**Primary disease % (n=52)**	**Recurrent disease % (n=172)**	**P value**	**Total (n=224)**
Primary healing rate (3 months)	77 (40/52)	64 (110/172)	0.1	66.9 (150/224)
Recurrence rate	23 (12/52)*	32 (56/172)^	0.2	30.3 (68/224)
Delayed wound healing^^		(6/172)		
Overall healing rate (12 months)	92.3 (48/52)	80.2 (138/172)	0.06	83 (186/224)
Post-operative Wexner score	0 (0-2)	0 (0-3)	0.9	0 (0-3)

*all patients' fistulas were retreated with VAAFT including abscess drainage in 6 patients, all healed within 2 months.

^^ 6 patients with delayed wound healing had local excision with complete healing in 2 months.

^36 patients (with secondary/horseshoe tracts) underwent VAAFT surgery, 8 had abscess drainage and in 12 fistulectomy was performed. 14 of these patients were disease free between 8 to 12 months.

No recurrences were observed at 2 years and at 5 years follow-up (n=13).

Pain (assessed using VAS) and need for analgesics

At discharge all patients reported very low pain (median VAS 2, range 1-4). 14.7% (33/224) patients needed analgesics for 3 to 4 days after treatment. None of the patients had pain at 7 days follow-up.

Return to normal activities

All patients were able to resume daily activities within a median of 7 days from surgery (range 2 to 12 days).

Safety

Adverse events

	% (n)
Perianal and gluteal edema (caused by infiltration of the irrigation solution in the ischio-rectal space, disappeared in 12 to 24 hours)	5.3 (12/224)
Incontinence	0

Abbreviations used: VAAFT, video-assisted anal fistula treatment.

Study 5 Cheung FY (2018)

Details

Study type	**Case series**
Country	UK
Recruitment period	2014 to 2016
Study population and number	n=**78 patients with perianal fistulae treated with VAAFT** **Type of fistula:** intersphincteric 5, transsphincteric 63, suprasphincteric 4, horseshoe 1, non-anal 1. **Crohn's disease** n=7 **Length of time patients had symptoms prior to treatment:** median 11 months (range 5 to 17months)
Age and sex	Mean age 43.4 years; 61% (48/78) male.
Patient selection criteria	All patients with complex perianal fistulae and underwent VAAFT have been included in the study. Patients under 18 years old, affected by Crohn's disease and procedures undertaken in emergency setting have been excluded.
Technique	All patients had Video-assisted anal fistula treatment (VAAFT by Karl Stroz GmbH) as a day case. Continuous irrigation provided by glycine mannitol 1% solution. Closure of the internal opening was done with a mucosal advancement flap.
Follow-up	**Median 14 months (range 7 to 19 months)**
Conflict of interest/source of funding	Authors declare no conflicts of interest or financial support.

Analysis

Follow-up issues: complete follow-up data available in 74 patients and comparable across cured and symptomatic patients (p=0.4).

Study design issues: reviewed a prospectively maintained database from a single centre, collected data on demographics, types of fistulae and previous surgeries. Patients were assessed for recurrence of symptoms at planned review and asked to self-report as 'cured' or symptomatic. Lack of objective assessments.

Study population issues: 6 patients had diabetes and 12 smoked. Most patients had recurrent disease and 77% (54/78) having had previous fistula surgery. Median number of procedures pre-VAAFT was 2 (range 1-4).

Key efficacy and safety findings

<table>
<tr><td>Efficacy</td><td>Safety</td></tr>
<tr><td>Number of patients analysed: 74
Healing rate after VAAFT (self-reported)
<table>
<tr><th></th><th>% (n)</th></tr>
<tr><td>Cured (asymptomatic)*</td><td>81 (60/74)</td></tr>
<tr><td>Symptomatic^</td><td>19 (14/74)</td></tr>
</table>
*including 5 patients with Crohn’s disease and 1 who had 10 previous surgical procedures.
^might be due to occult side branches not being identified and cauterised.
Factors considered to affect outcome
Logistical stepwise regression did not demonstrate any statistically significant factors that may have been considered to affect outcome (age, gender, diabetes, previous surgery, Crohn’s disease, smoking, type of fistula).

Seton placement prior to VAAFT
A subgroup analysis comparing the outcome to the number of prior operations before VAAFT with those patients who had VAAFT as the primary procedure showed that those who had previous surgeries mostly Seton placement did not have a better healing rate (p=0.805).
<table>
<tr><th></th><th>Curd by one VAAFT</th><th>Cured at end of study</th></tr>
<tr><td>Seton placement prior to VAAFT (n=38)</td><td>27</td><td>31</td></tr>
<tr><td>No seton placement prior to VAAFT (n=36)</td><td>24</td><td>29</td></tr>
</table></td><td>Adverse events
No complications or emergency readmissions.</td></tr>
<tr><td colspan="2">Abbreviations used: VAAFT, video-assisted anal fistula treatment.</td></tr>
</table>

Study 6 Romaniszyn M (2017)

Details

Study type	**Case series**
Country	Poland
Recruitment period	2011-2016
Study population and number	n=**68 patients with perianal fistulae treated with VAAFT** **Type of fistula:** simple transsphincteric fistula n=30, complex fistula (extra or suprasphincteric with fluid in soft tissues) n=38.
Age and sex	Mean age 43.8 years; 71% (48/68) male.
Patient selection criteria	All patients with perianal fistulae who qualified for elective surgery were included in the study. Patients with low intersphincteric fistulae (treated by simple lay-open procedure) or patients who refused to undergo the minimally invasive treatment with the use of a fistuloscope were excluded.
Technique	All patients had Video-assisted anal fistula treatment (VAAFT by Karl Stroz GmbH) as a day case under spinal anaesthesia and suing a single dose of antibiotics. Abscesses or larger fluid collections were drained before the procedure. Some patients had MRI or endoscopic ultrasound (EUS) before the treatment. Closure of the internal opening was done either with sutures or an advancement flap. Patients were recommended high fibre diet, cleaning the wound with an antiseptic lotion and pain killers if necessary.
Follow-up	**Mean 31 months (range 3 to 72 months)**
Conflict of interest/source of funding	Study was funded by the Jagiellonian university statutory funding. One author was invited as a speaker at a meeting in 2015 by the manufacturer of the equipment. Other than that, neither of the authors have any conflict of interest.

Analysis

Follow-up issues:

Study design issues: single centre, nonrandomised prospective study.

Study population issues: no patients had any continence disorders. Patients mainly complained of pain in the anal region, pus excretion and occasional bleeding from the external opening.

Key efficacy and safety findings

Efficacy

Number of patients analysed: **68**

Healing rate after VAAFT (on the type of fistula)

	Simple fistula % (n=30)	**Complex fistula % (n=38)**	**Total % (n=68)**
Primary healing	80 (24/30)	71% (27/38)	75 (51/68)
Recurrence^	7 (2/30)	32 (12/38)	21 (14/68)
Failed to heal/persistent fistula*	20 (6/30)	29 (11/38)	25 (17/68)
Overall healing rate	73 (22/30)	39 (15/38)	54 (37/68)
Time to healing (days)			52 (range 15-98)

^between 1 and 6 months after initial healing.

*had secondary procedures such as repeated VAAFT, fistulectomy or seton placement.

The difference in success rates between the simple fistula group and the complex fistula group was statistically significant (73.3% versus 39.4%, p=0.011).

Women had higher healing rates both in simple (81.82% versus 68.42%, p=ns) and complex fistulae (77.78% versus 27.95%, p=0.016) compared with men.

Operating time

The mean operating time was 65 minutes (range 20 to 135 minutes). There was a correlation with a drop in operating time and the learning curve.

Safety

Adverse events

Complication	**n**
Severe headache (associated with spinal analgesia, symptoms resolved after treatment with painkillers)	1
Damaged cautery probe leaving a severed metal electrode tip in the wound (by an electric arch) the metal tip was successfully recovered with forceps during the procedure.	1
Worsening of continence after surgery	0

Abbreviations used: VAAFT, video-assisted anal fistula treatment.

Study 7 Adegbola SO (2018)

Details

Study type	**Case series**
Country	UK
Recruitment period	2015-2017
Study population and number	n=**25 patients with complex Crohn's anal fistulae treated with VAAFT** **Fistula complexity:** high fistula n=12, horseshoe fistula n=10, more than 1 secondary extension 100%, multiple internal openings n=9, more than 1 external opening n=11, concomitant perineal disease n=5, presence of proctitis n=6. **Previous surgeries:** 100% (25/25), **median number of surgeries** n=4 (range 2-12)
Age and sex	Median age 32 years; 44% (11/25) male.
Patient selection criteria	Patients with persistent perianal fistula symptoms and complex Crohn's fistula (according to American Gastroenterological Association classification) undergoing VAAFT for symptomatic Crohn's anal fistula were included in the study.
Technique	All patients had Video-assisted anal fistula treatment (VAAFT by Karl Stroz GmbH) under general anaesthesia as a day case. Patient underwent diagnostic fistuloscopy and fulguration of tracts/secondary extensions. The internal opening of the fistulae were left open and setons were placed or changed after the procedure to maintain post-operative drainage.
Follow-up	**Mean 31 months (range 3 to 72 months)**
Conflict of interest/source of funding	None, one of the authors have been supported by a Royal College of Surgeons of England Research Scholarship.

Analysis

Follow-up issues: 3 patients missed follow-up appointments.

Study design issues: analysis of a prospectively maintained database. Patient reported outcome measures assessed using a generic (measure your medical outcome profile MYMOP) quality of life questionnaire and decision regret scale (DRS). Patients rated their symptoms on a 1-6 Likert scale and decisional regret scores (on a validated 1-5 self-reported Likert scale) both pre and post-operatively at 6 weeks follow-up. Other outcomes such as any complications and 30 day reoperation rates were also analysed.

Study population issues: 92% (23/25) of the patients were on biological medication. Patients had multiple procedures.

Key efficacy and safety findings

<table>
<tr><th>Efficacy</th><th>Safety</th></tr>
<tr><td>
Number of patients analysed: 25
Procedural outcomes
<table>
<tr><td>Procedure completed</td><td>24</td></tr>
<tr><td>Procedure abandoned (due to inability to intubate the fistula tract with fistuloscope)</td><td>1</td></tr>
</table>
Quality of life (assessed pain and discharge scores using MYMOP pre and post-operatively at 6 weeks) (n=21)
<table>
<tr><td>Median pre-operative pain score</td><td>4 (range 1-6)</td></tr>
<tr><td>Median post-operative pain score</td><td>1 (range 0-4)
P<0.001</td></tr>
<tr><td>Median pre-operative discharge score</td><td>4 (range 1-6)</td></tr>
<tr><td>Median post-operative discharge score</td><td>1 (range 0-5)
P<0.001</td></tr>
</table>
Decisional regret scores (assessed using validated decision regret scale) (n=21/24)
<table>
<tr><td>Agreed or strongly agreed it was the right decision</td><td>81%</td></tr>
<tr><td>Agreed or strongly agreed that they would make the decision to undergo the procedure again</td><td>71</td></tr>
<tr><td>Disagreed with the statement that they regretted undergoing the procedure</td><td>100%</td></tr>
<tr><td>Disagreed or strongly disagreed that the choice did them harm</td><td>95%</td></tr>
</table>
Repeat VAAFT
<table>
<tr><td>Number of patients who had repeat VAAFT</td><td>9</td></tr>
<tr><td>Median number of repeat VAAFT procedures</td><td>1 (range 0-3)</td></tr>
</table>
</td><td>
Pain and swelling reported in 1 patient, admitted to hospital but no abscess found.
No other complications were reported.
</td></tr>
<tr><td colspan="2">Abbreviations used: MYMOP, measure your medical outcome profile; VAAFT, video-assisted anal fistula treatment.</td></tr>
</table>

Validity and generalisability of the studies

- VAAFT is used to treat both simple and complex fistulae.
- Evidence in systematic reviews and meta-analyses is mainly from case series or cohort studies with small number of patients with anal fistulas treated mainly for high and complex fistulas including few patients secondary to Crohn's disease. There was high heterogeneity across studies in terms of patient population, procedures (varied treatment/closure methods) and outcome measures reported.
- Success rates varied across studies. All studies reported that pain scores and complication rates are low.
- Follow-up was short and long term outcomes (healing and recurrence rates) are unknown.
- Most studies did not evaluate faecal incontinence, only 2 studies assessed sphincter muscle strength before and after VAAFT.
- Studies are mainly done outside the UK with only 2 from UK (which might limit generalisability to NHS practice).
- Only 1 study on VAAFT in patients with Crohn's perianal fistula reported quality of life outcomes.
- There are no randomised controlled trails comparing VAAFT with other sphincter-saving procedures, or comparing different methods of closure of internal opening during VAAFT.

Existing assessments of this procedure

There were no published assessments from other organisations identified at the time of the literature search.

Related NICE guidance

Below is a list of NICE guidance related to this procedure.

Interventional procedures

- Insertion of a collagen plug to close an abdominal wall enterocutaneous fistula. NICE interventional procedures guidance 507 (2014). Available from http://www.nice.org.uk/guidance/ipg507
- Closure of anal fistula using a suturable bioprosthetic. NICE interventional procedures guidance 410 (2011). Available from http://www.nice.org.uk/guidance/ipg410

Technology appraisals

- Darvadstrocel for treating complex perianal fistula in Crohn's disease [ID960]. NICE technology appraisal guidance in development. Expected publication date: December 2018

NICE Medtech briefing

- Permacol for treating anal fistulae. NICE Medtech innovation briefing 105 (2017). Available from http://www.nice.org.uk/guidance/mib105
- VAAFT for treating anal fistulae. NICE Medtech innovation briefing 102 (2017). Available from http://www.nice.org.uk/guidance/mib102

Additional information considered by IPAC

Specialist advisers' opinions

Specialist advice was sought from consultants who have been nominated or ratified by their Specialist Society or Royal College. The advice received is their individual opinion and is not intended to represent the view of the society. The advice provided by Specialist Advisers, in the form of the completed questionnaires, is normally published in full on the NICE website during public consultation, except in circumstances but not limited to, where comments are considered voluminous, or publication would be unlawful or inappropriate. One Specialist Advisor Questionnaires for endoscopic ablation for an anal fistula were submitted and can be found on the NICE website.

Patient commentators' opinions

NICE's Public Involvement Programme received 7 online reports from patients who had the procedure. The patient commentators' views on the procedure were

consistent with the published evidence and the opinions of the specialist advisers.

Company engagement

A structured information request was sent to 1 company who manufacture a potentially relevant device for use in this procedure. NICE received 1 completed submission. This was considered by the IP team and any relevant points have been taken into consideration when preparing this overview.

Issues for consideration by IPAC

- Trial NCT02313597: VAAFT Vs SETON in the management of high peri anal fistula. Status: Recruiting (60 participants expected). Study completion date: July 2016. Location: Pakistan.
- Trial NCT02585167: Endoscopic treatment of complex anal fistulas. Status: Recruiting (66 participants estimated). Estimated primary completion date: September 2017. Primary comparator: Fistulotomy. Location: Denmark.

References

1. Garg P and Singh P (2017). Video-Assisted Anal Fistula Treatment (VAAFT) in Cryptoglandular fistula-in-ano: A systematic review and proportional meta-analysis. International Journal of Surgery (46) 85-91.
2. Emile SH, Elfeki H, Shalaby M and Sakr A (2018). A Systematic review and meta-analysis of the efficacy and safety of video-assisted anal fistula treatment (VAAFT). Surgical Endoscopy (32) 4 2084-2093.
3. Adegbola SO, Sahnan K, Pellino G et al (2017). Short-term efficacy and safety of three novel sphincter sparing techniques for anal fistulae: A systematic review. Techniques in Coloproctology, 21 (10), 775-782.
4. Stazi A, Izzo P, D'Angelo F et al (2018). Video-assisted anal fistula treatment in the management of complex anal fistula: a single-center experience. Minerva Chirurgica (73) 2 142-150.
5. Cheung FY, Appleton ND, Rout S et al (2018). Video-assisted anal fistula treatment: a high volume unit initial experience. Annals of the Royal College of Surgeons of England (100) 1 37-41.
6. Romaniszyn M and Walega P (2017). Video-Assisted Anal Fistula Treatment: Pros and Cons of This Minimally Invasive Method for Treatment of Perianal Fistulas. Gastroenterology research & practice (2017) 9518310 (7 pages).
7. Adegbola SO, Sahnan K, Tozer PJ et al (2018). Symptom amelioration in Crohn's perianal fistulas using video assisted anal fistula treatment (VAAFT). Journal of Crohn's & colitis (25), 1067-1072.

Literature search strategy

Databases	Date searched	Version/files
Cochrane Database of Systematic Reviews – CDSR (Cochrane Library)	28/12/2018	Issue 12 of 12, December 2018
Cochrane Central Database of Controlled Trials – CENTRAL (Cochrane Library)	28/12/2018	Issue 12 of 12, December 2018
HTA database (CRD website)	28/12/2018	n/a
MEDLINE (Ovid)	28/12/2018	1946 to December 27, 2018
MEDLINE In-Process (Ovid) & MEDLINE Epubs ahead of print (Ovid)	28/12/2018	December 27, 2018
EMBASE (Ovid)	28/12/2018	1974 to 2018 Week 52

The following search strategy was used to identify papers in MEDLINE. A similar strategy was used to identify papers in other databases.

1 Rectal Fistula/ or Anal Canal/su

2 ((Anal or anus or rectal or rectum or transphincteric or intersphincteric or ano-rectal or anorectal or plural or peri-anal or perianal or multiple or recurr* or high or horse shoe) adj4 fistula*).tw.

3 (fistula-in-ano or fistula in ano).tw.

4 or/1-3

5 Video-Assisted Surgery/

6 ((video-assist* or (video* adj2 assist*)) adj2 (ablat* or surg* or tech* or treat* or therap* or device*)).tw.

7 (video-telescope* or video telescope*).tw.

8 (unipolar-electrode* or unipolar electrode*).tw.

9 ((Fistula* or endoscop*) adj2 (brush* or forcep*)).tw.

10 fistuloscop*.tw.

11 (Endoscop* adj4 ablat*).tw.

12 *Endoscopy/mt

13 VAAFT.tw.

14 Video* assist* anal fistula* treat*.tw.

15 or/5-14

16 4 and 15

17 limit 16 to ed=20180622-20181231

Appendix

The following table outlines the studies that are considered potentially relevant to the IP overview but were not included in the main data extraction table (table 2). It is by no means an exhaustive list of potentially relevant studies.

Article	Number of patients/follow-up	Direction of conclusions	Reasons for non-inclusion in table 2
Chowbey PK, Khullar R, Sharma A, Soni V, Najma K, Baijal M (2015) Minimally Invasive Anal Fistula Treatment (MAFT)-An Appraisal of Early Results in 416 Patients. Indian J Surg. Dec;77 (Suppl 2):716-21.	N=580 Uncontrolled open-label study VAAFT (n=416), fistulotomy for superficial subcutaneous fistulae (n=114), LIFT with fulguration of distal fistula tract (n=21), incision and drainage of abscess only (n=29). Follow-up; 1 year	Internal fistula opening could not be found in 101 people and was too high to reach in 5 people. 391/416 procedures were done as day cases. 7 people were readmitted due to bleeding from the rectum or fistula tract. Mean VAS score (0–10) was 3.1 at discharge and 1.6 after 1 week. Discharge from the external fistula opening was found in 87% of people after 1 week. By 1 month this had reduced to 42%. 134 patients were available for 1-year follow-up and primary healing of the fistula was seen in 99 people. 35 people had recurrence; 20 with serous discharge, 9 with pus discharge and 6 with bloody discharge.	Included in systematic review added to table 2.
Grolich T, Skricka T et al (2014). Role of Video Assisted Anal Fistula Treatment in our management of fistula-in-ano. Acta Chir iUGOSL 61: 83-85.	Case series N=30 Patients with chronic fistula-in-ano of IBD and non-IBD benign etiology (9 with Crohn's disease) Treated with VAAFT Follow-up 4 months	Fistuloscopy was at tempted in 30 patients, finished in 93% and internal opening was found in 67%. No procedure-related morbidity was observed.	Included in systematic review added to table 2
Jiang, H. H., Liu, H. L., Li, Z et al (2017). Video-Assisted Anal Fistula Treatment (VAAFT) for Complex Anal Fistula: A Preliminary Evaluation in China. Medical Science Monitor (23) 2065-2071.	Case series N=52 patients with complex anal fistula were treated with VAAFT Follow-up 9 months	VAAFT was performed successfully in all 52 patients. The median operation time was 55 minutes. Internal openings were identified in all cases. 50 cases were closed with sutures, and 2 were closed with staplers. Complications included perianal sepsis in 3 cases and bleeding in another 3 cases. Complete healing without recurrence was achieved in 44 patients (84.6%) after 9 months of follow-up. No fecal incontinence was observed. Furthermore, a significant improvement in Gastrointestinal Quality of Life Index (GIQLI) score was observed from pre-operative baseline (mean, 85.5) to 3-month follow-up (mean, 105.4; $p<0.001$), and this increase was maintained at 9-months follow-up (mean, 109.6; $p<0.001$).	Included in systematic review added to table 2

Kochhar G, Saha S et al (2014) Video-assisted anal fistula treatment. JSLS. Jul-Sep;18(3).	N=82 Uncontrolled open-label study 82 fistulae in ano (70 simple and 12 complex) were treated with VAAFT. Follow-up: 6 months	The mean VAS score after the procedure was 4 and reduced to nil after 24 hours and no pain at 1-week follow-up. All patients returned to work after 5 days. After 1 week, 28 patients (34.15%) had discharge from the wound. 13 patients (15.85%) had a recurrence during 6 month follow-up. Anal manometry showed that there were no statistically significant changes in the mean resting anal pressures and mean anal squeeze pressures before and after the procedure. None of the patients reported any problems with faecal continence.	Included in systematic review added to table 2.
Liaqat, N., Iqbal, A., Dar, S. H. and Liaqat, F. Video Assisted Anal Fistula Treatment in a Child with Perianal Fistula. Apsp Journal of Case Reports (7) 1 3 Jan-Apr 2016.	Case report N=1 VVAFT for perianal fistula.	We present a 6-year-old female who developed perianal fistula following rectal biopsy for which VAAFT was done successfully	Lager studies included in table 2.
Liu H, Xiao Y et al (2015). Preliminary efficacy of video-assisted anal fistula treatment for complex anal fistula. 12, 1207-1210.	Case series N=11 patients with complex fistulas VAAFT Follow-up 1-31 months	VAAFT was successfully done in all. The internal ostium was closed using sutures in 10 and stapler in 1. The mean operative time was 42 minutes, mean hospital stay was 4 days. Complications included bleeding and perianal infection in 1 patient. Success rate was 72.2% (8/11) and no incontinence was observed at 1 to 32 months follow-up.	Included in systematic review added to table 2.
Meinero P and Mori. L. Video-assisted anal fistula treatment (VAAFT): a novel sphincter-saving procedure for treating complex anal fistulas. Tech Coloproctol. 2011 Dec; 15(4): 417–422.	N=136 complex fistulae were treated with VAAFT. Uncontrolled open-label study	Primary healing was achieved in 72 people (73.5%) within 2 to 3 months. Of the 26 (26.5%) unsuccessful procedures, 19 people had a repeat VAAFT procedure, leading to another 9 fistulae being fully healed. Recurrence rate was 26.5%. No major complications, infection, incontinence or bleeding occurred as a result of treatment with VAAFT and all patients were discharged on the day of surgery. Mean VAS pain score in the first 48 hours following surgery was 4.5, no pain was reported after 1 week. All people had returned to work within 3 days.	Included in systematic review added to table 2.

Meinero, P., Mori, L. and Gasloli, G (2014). Video-assisted anal fistula treatment: a new concept of treating anal fistulas. Diseases of the Colon & Rectum (57) 3 354-9.	Retrospective case series N=203 patients with complex anal fistulas treated by VAAFT. Follow-up 15 months	The 6-month cumulative probability of freedom from fistula estimated according to a Kaplan-Meier analysis is 70% (95%CI, 64%-76%). No major complications occurred. No patients reported a reduction in their post-operative continence score.	Included in systematic review added to table 2.
Mendes, CR., Ferreira, LS et al (2014). Video-assisted anal fistula treatment: technical considerations and preliminary results of the first Brazilian experience. ABCD, Arquivos Brasileiros de Cirurgia Digestiva (27) 1 77-81.	Case series N=8 VAAFT for anal fistula Follow-up 5 months	The mean distance between the anal verge and the external anal orifice was 5.5 cm. Mean operative time was 31.75 min. In all cases, the internal fistula opening could be identified after complete fistuloscopy. In all cases, internal fistula opening was closed using full-thickness suture. There were no intraoperative or post-operative complications. After a 5-month follow-up, recurrence was observed in one (12.5%) patient.	Included in systematic review added to table 2.
Pini Prato A, Zanaboni C et al (2016). Preliminary results of video-assisted anal fistula treatment (VAAFT) in children. Techniques in Coloproctology (20) 5 279-85.	Case series N=9 paediatric patients treated with VAAFT median age was 9.6 years Five fistulas were idiopathic, three iatrogenic, and one associated with Crohn's disease	The median length of surgery was 41 min. The median hospital stay was 24 h, and the median length of follow-up was 10 months. Resolution of the fistula was observed in all patients who underwent a complete VAAFT. In four out of five patients who underwent an incomplete procedure (without mucosal sleeve), the fistula recurred. No incontinence or soiling was reported in the medium term.	Included in systematic review added to table 2.
Rios HP, Goulart A et al (2017). Enterocutaneous fistula: a novel video-assisted approach. Videosurgery Miniinv 2017; 12 (3): 297–300	Case report N=1 patient with entero-cutaneous fistula treated with VAAFT	The patient was discharged 5 days later without complications. Two months later the wound was completely healed without evidence of recurrence. This procedure represents an alternative treatment for enterocutaneous fistula using a minimally invasive technique.	Larger studies included in table 2.

Schwandner, O. Video-assisted anal fistula treatment (VAAFT) combined with advancement flap repair in Crohn's disease. Techniques in Coloproctology (17) 2 221-5 Apr 2013.	Case series N= 13 patients with Crohn's associated complex fistulas	The completion rate was 85% (11/13). In these 11 patients (median age 34 years, 64% females), complex fistulas were transsphincteric (8), suprasphincteric (2) and recto-vaginal (1). Forty-six percent (5/11) had concomitant therapy with biologic drugs. In 36% (4/11), VAAFT was performed with fecal diversion. Median duration of surgery was 22 (range 18-42) minutes. Using VAAFT, additional side tracts not detected preoperatively could be identified in 64% (7/11). No morbidity occurred. After a mean follow-up of 9 months, the success rate was 82% (9/11). No deterioration of continence was documented (Cleveland Clinic Incontinence Score 2.4 vs. 1.6, p > 0.05).	Included in systematic review added to table 2
Selvarajan A (2015). Video-Assisted Anal Fistula Treatment (VAAFT): Johor Bahru's Humble Beginnings. Int J Intg Med Sci 2015, Vol 2(10):175-77.	Case series N=8 VAAFT Follow-up not reported	Mean operative time is 39 minutes. Internal fistula opening could be identified in 3 patients after complete fistuloscopy. The mean pain score observed is 3 using the numeric pain score. There were no intraoperative or post-operative complications. During due course of follow-up, it was observed that in 37.5% of patients had non-resolving symptoms.	Included in systematic review added to table 2
Seow –En I et al (2016). An experience with video-assisted anal fistula treatment (VAAFT) with new insights into the treatment of anal fistulae. Tech Coloproctol (2016) 20:389–393	Case series N=41 patients with cryptoglandular anal fistulae treated with VAAFT. Follow-up: 34 months (range 12-44)	Primary healing rate was 70.7 % at a median follow-up of 34 months. Twelve patients recurred or did not heal and underwent a repeat VAAFT procedure utilising various methods of dealing with the internal opening. There was a secondary healing rate of 83 % with two recurrences. Overall, stapling of the internal opening had a 22 % recurrence rate, while anorectal advancement flap had a 75 % failure rate. There was no recurrence seen in six cases after using the over-the-scope-clip (OTSC) system to secure the internal opening.	Included in systematic review added to table 2

Walega P, Romaniszyn M et al (2014). VAAFT: a new minimally invasive method in the diagnostics and treatment of anal fistulas – initial results. POLSKI PRZEGLĄD CHIRURGICZNY 2014, 86, 1, 7–10	Case series N=18 patients with anal fistula VAAFT Follow-up: 10 months	In most cases the trans-sphincter fistula was observed. There was 1 intersphincteric fistula. The internal ostium was supplied by means of an advancement flap in 3 cases, in 11 a mattress suture, 1 with additional tissue glue. In 4 cases the internal ostium was tightly covered by mucosa. Surgical complications were not observed during the procedure. During further observation a permanent fistula was observed in 4 (22%) patients, and in two (17%), recurrence of anal fistula. In the remaining 12 patients one observed healing without fistula recurrence. Complications were not observed, including stool and gas control deterioration (based on the FISI scoring).	Included in systematic review added to table 2
Zarin M, Khan MI, VAAFT: Video Assisted Anal Fistula Treatment; Bringing revolution in Fistula treatment. Pakistan Journal of Medical Sciences. Vol 31 (5), 1233-35.	N=40 fistulae (16 simple and 24 complex) were treated with VAAFT. Uncontrolled open-label study follow-up 6 months	Primary healing was achieved in 20 people at 6 weeks follow-up. Primary healing had been achieved in all 40 patients after 12 weeks of follow-up, however, 3 people had a repeat VAAFT procedure during this time. No major complications were noted. 17 people (42.5%) had minor discharge and itching before healing.	Included in systematic review added to table 2