

# Recto-Urinary Fistula (RUF) treated by Transanal Endoscopic Microsurgery (TEM)

## Review of the literature and surgical technique



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### Recto-Urinary Fistula (RUF) treated by Transanal Endoscopic Microsurgery (TEM). Review of the literature and surgical technique

**AIM:** Recto-Urinary Fistula (RUF) is a rare complication of pelvic surgery. Different approaches are reported in literature but a gold standard treatment has not yet been achieved. Transanal Endoscopic Microsurgery (TEM) is a minimally-invasive approach with well known advantages as magnification, 3D view and lighting of the operative field. Aim of the present review is to report the current evidence in literature about technique and results of RUF treatment by TEM and to suggest some key points for its correct management.

**MATERIALS OF STUDY:** After a medline in Pubmed and Scopus databases, seven papers were eligible for the present study. Data were reviewed on the basis of the cases reported, patient's characteristics, surgical techniques and results.

**RESULTS:** Eighteen cases have been reported in the literature from 1996 to 2005. The healing success rate was 77.8%. Fecal and urinary diversion were performed before TEM-assisted procedure in the 83% and 94% of cases, respectively. Recurrence was observed in four patients (22%).

**DISCUSSION:** A gold standard treatment of RUF should ensure the complete removal of scar tissue around the fistula, in order to perform a tension free suture on healthy margins with adequate vascularization. Preoperative stoma improves the healing of the fistula, reducing local inflammation and infections.

**CONCLUSIONS:** There is not common view of this topic in literature and clarify which could be the best treatment is a key condition due to high failure rate of the surgical proposed techniques. Recurrences treatment has a lower cure rate if compared to primary lesions, nevertheless more studies are required to confirm this data.

**KEY WORDS:** Recto-Urinary Fistula (RUF), Transanal Endoscopic Microsurgery (TEM), Transanal approach

### Introduction

Recto-Urinary Fistula (RUF) is a rare complication of prostatic and rectal cancer surgery<sup>1,2</sup>. This condition affects physically and psychologically patients' Quality of

Life (QoL) and conservative approaches are rarely successful consequently most patients still require surgery<sup>1,2</sup>. RUF is associated with procedure as prostatectomy (laparoscopic, robotic, retropubic or perineal), Trans-Urethral Resection of the Prostate (TURP), rectal surgery, pelvic external beam irradiation, cryotherapy, brachiterapy, High Intensity Focused Ultrasound (HIFU) and Inflammatory Bowel Diseases (IBD)<sup>1-6</sup>. Fecaluria, pneumaturia, rectal urine drainage are the most common symptoms and complications like local infection or sepsis could be a life risk factor<sup>1,2</sup>.

Spontaneous healing is achieved in 10% of patients by fecal and/or urinary diversion, antibiotics therapy, silk line placement. In 2,4% no treatment is performed<sup>1</sup>.

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Table I - Different approaches and rate of success reported in literature <sup>1</sup>.

Surgical Approach	Rate of cases	Rate of Success
Trans-perineal	65.9%	90%
Trans-sphincteric	15.7%	88%
Trans-abdominal	12.5%	87%
Trans-anal	5.9%	59%

Due to this data, surgery remains the best treatment option to achieve definitive healing.

In literature different invasive surgical approaches have been described for the treatment of RUF: trans-perineal, trans-sphincteric, transanal and trans-abdominal <sup>1,2,7,8</sup> (Table I). Tissue flap interposition as graciloplasty or omental flap are the most employed techniques. These procedures performed by a trans-abdominal, trans-sphincteric or trans-perineal approach are often very invasive and need extended and very painful incisions that influence hospitalization and can affect the complications rate <sup>1,2,8,9</sup>.

Techniques as gracile muscle interposition flap, rectal wall advancement flap and direct suture, performed by transanal approach <sup>1,10-12</sup> are not frequently used (5.9%) <sup>1</sup> Though they offer advantage of being less invasive improving patient's QoL <sup>13,14</sup>.

In 1983 Buess proposed Transanal Endoscopic Microsurgery (TEM) for the treatment of benign lesions and T1 rectal cancer <sup>15,16</sup>. TEM has emerged recently as an alternative to traditional surgery also for the treatment of T2-3 N0 rectal tumors after neoadjuvant radiochemotherapy (n-RCT) <sup>15</sup>. Main advantages of TEM are the magnification, 3D view and lighting that allow a precise removal of sclerotic tissue <sup>9,18</sup>. As well as adenocarcinomas and adenomas, by TEM is possible to treat very different rectal diseases as neuroendocrine tumors, pelvic abscess, benign rectal stenosis, gastrointestinal stromal tumors (GIST), endorectal condylomata acuminata, rectal prolapse, repair of traumatic and iatrogenic perforations of the rectum <sup>19</sup>. In the treatment of RUF by TEM perineal or abdominal incisions are not necessary, reducing blood loss, hospitalization, postoperative pain and complications, unlike more invasive techniques as graciloplasty or tissue flap interposition <sup>1,2,7,8,9,18,20</sup>.

Aim of the present review, is to report the current evidence in literature about technique and results of the treatment of RUF by TEM and to suggest the key points for its correct management.

## Materials and Methods

A medline was made searching in Pubmed and Scopus databases under the following key terms: 1) "rectovesical fistula transanal endoscopic microsurgery", 2) "rectovesical fistula TEM"; 3) "rectourethral fistula transanal endoscopic microsurgery"; 4) "rectourethral fistula TEM".

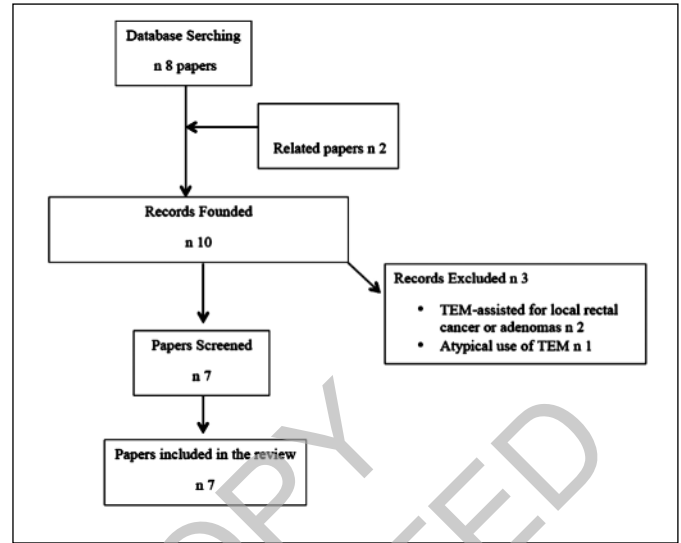


Fig. 1: Flow chart of the selection of studies eligible for data extraction and analysis.

Papers eligible for this study were in English language and about the treatment of RUF by TEM. Other papers about use of TEM or other surgical techniques were excluded. The research was completed through the inclusion of related papers.

Eight papers were found: two were excluded because the topic regards TEM procedure for rectal cancer or adenomas and one paper was excluded because about atypical use of TEM. Other two papers were extrapolated from the references of the read studies. The authors have also verified that have not been used other devices for transanal surgery alternative to TEM. The research resulted in seven studies, which were finally included in the present review, and data were extrapolated on the basis of the cases reported, patients' characteristics, surgical technique and results <sup>21-27</sup> (Fig. 1).

TEM instruments include a rigid operative rectoscope, a rigid faceplate with three working inserts for the appropriate instrumentation, a binocular endoscope (for 3D view), a light source, a camera and inserts for insufflation and suction. The set is completed by a special articulated arm (Martin's Arm) which links the rectoscope to the operative table in the right position.

## Review of the Literature

From 1996 to 2015 a TEM-assisted repair for recto-urinary fistula was performed in 18 male patients with a mean age of 67.2 years (range 55-76) <sup>21-27</sup>. At the time of procedure, fifteen patients (83.3%) had fecal diversion and 17 patients (94.5%) had an indwelling bladder catheter for urinary diversion <sup>19-25</sup> TEM was the first surgical attempt in eight patient (44.4%), the second one

Table II - Cases characteristics of RUF treated by TEM reported in literature.

Author	Case series	Age	Recurrence	Oostomy	Urinary Diversion	Success
Wilbert <sup>21</sup>	1	73	1	Yes	Yes	Yes
	2	77	0	No	Yes	Yes
Quinlan <sup>22</sup>	3	71	0	No	n.a.	Yes
Bochove-Overgaauw <sup>23</sup>	4	55	0	Yes	Yes	Yes
	5	65	1	Yes	Yes	No
Pigalarga <sup>24</sup>	6	56	0	No	Yes	Yes
Andrews <sup>25</sup>	7	68	0	Yes	Yes	Yes
Kanehira <sup>26</sup>	8	66	1	Yes	Yes	Yes
	9	69	2	Yes	Yes	No
	10	70	2	Yes	Yes	Yes
	11	64	1	Yes	Yes	Yes
	12	68	3	Yes	Yes	No
	13	71	1	Yes	Yes	Yes
	14	76	1	Yes	Yes	Yes
	15	62	0	Yes	Yes	Yes
	16	70	3	Yes	Yes	No
	17	67	0	Yes	Yes	Yes
D'Ambrosio <sup>27</sup>	18	62	0	Yes	Yes	Yes
	Summary	67,2	0,9	83,30%	94,50%	77,80%

Recurrences: surgical procedures before treatment by TEM. n.a.: not available

in six (33.3%), the third one in two (11.1%) and in other two patients it was performed as fourth attempt <sup>21-27</sup> (Table II).

The first study was reported in 1996 from Wilbert et al., about two patients with recto-urethral fistula after radical prostatectomy and pelvic lymphadenectomy, treated by the excision of the scar tissue around the fistula, followed by endoscopic suture and simultaneous trans-urethral fulguration and fibrin application <sup>21</sup>. This resulted in closure of the fistula in both patients with no postoperative complications and no evidence of clinical symptoms or recurrences 18 months after surgery <sup>21</sup>.

In 2005 Quinlan et al. managed a recto-urethral fistula by TEM in a 71-years-old man who underwent radical prostatectomy <sup>22</sup>. The fistula scar tissue was excised and was raised a full-thickness rectal wall flap before suturing and repairing the defect <sup>22</sup>. After nine months of follow up the fistula was closed <sup>22</sup>.

Bochove-Overgaauw et al. performed fistula repair in two patients who underwent previous laparoscopic radical prostatectomy <sup>23</sup>. A full-thickness excision of the rectal wall was made 1 cm around the fistula and the defect was sutured on the urethral and rectal wall. The authors reported one failure in a patient previously treated by a failed graciloplasty <sup>23</sup>.

Pigalarga et al. in 2011 described a successful repair of iatrogenic recto-urethral fistula in a 56-years old man who underwent radical retropubic prostatectomy through TEM-assisted rectal advancement flap and urethral stent placement <sup>24</sup>.

In the same year another case was reported by Andrews et al. of a 68-year-old man who experienced a recto-ure-

thral fistula two week after HIFU for prostatic cancer <sup>25</sup>. The fistula was closed by the excision of the sclerotic margins, a full-thickness rectal wall flap by TEM and closure of the urethral wall with a single Z-suture. Endoscopy one year after surgery showed a well-healed scar <sup>25</sup>.

From 2004 to 2013, Kanehira et al. report the largest series in literature using TEM for the treatment of 10 patients affected by recto-vesical fistula <sup>26</sup>. The procedure was performed by the resection of the scar tissue around the defect and it was extended until the bladder mucosa <sup>26</sup>. Bladder and rectal wall were then repaired with absorbable monofilament suture <sup>26</sup>. A success rate of 70% was reported due to three cases of recurrence observed in patients with a history of repeated surgery, irradiation and HIFU <sup>24</sup>. No postoperative complications were observed <sup>26</sup>.

Finally, in 2015 D'Ambrosio et al. treated a 62 years-old patient with recto-vesical fistula occurred during laparoscopic prostatectomy after n-RCT, 4 cm from the anal verge, detected on postoperative day six by gastrografin enema and methylene blue injection <sup>27</sup>. The first step was to perform an ileostomy and the placement of an indwelling bladder catheter <sup>27</sup>. On the operative table, cystoscopy was performed in order to identify the bladder side orifice and to introduce a small catheter through the fistula <sup>27</sup>. By TEM, scar tissue was removed by a full-thickness excision in order to achieve the wall bladder and visualize the defect, then the communication was repaired by a double semi-continuous suture with PDS 2.0 either on the bladder and rectal wall <sup>27</sup>. Patient was discharged with the ileostomy and the indwelling

catheter on postoperative day ten. Three months after surgery, based on negative endoscopy and cystoscopy, patient underwent ileostomy closure and bladder catheter was removed <sup>27</sup>.

In 19 years, 18 cases of treatment of recto-urinary fistula by TEM have been reported in the literature with a success rate of 77,8% (14 patients). Fecal diversion was performed before the procedure in 83% of cases (15 patients) and 17 patients (94%) had urinary diversion with indwelling catheter (for one patient data was missed). Recurrence was observed in 4 patients: two had three previous attempts to repair, presenting at the surgery an extremely tough tissue due a severe fibrosis; one had history of repeated irradiation and HIFU as adjuvant therapy for prostatic cancer and two surgical attempts of repair <sup>26</sup>; the fourth patient underwent one previous surgical attempt by graciloplasty <sup>23</sup>. All patients had previous fecal and urine diversion with temporary ileostomy and indwelling catheter positioning <sup>23, 26</sup>. Two recurrent patients refused any additional surgical treatment <sup>26</sup> one was treated with gracilis muscle interposition by perineal approach with the subsequent healing of the fistula <sup>26</sup> and the last one healed after a gracilis muscle interposition using a Kraske trans-coccygeal approach <sup>23</sup>.

In these 18 reported cases the surgical technique is very similar between the different authors, with few differences. In fact, the fistula was always treated by removal of the tissue around the defect, followed by a tension free suture on healthy margins. Only Wilbert et al. used fibrin glue apposition for protecting the healing suture line <sup>21</sup> and Quinlan et al. did not perform fecal diversion before the procedure <sup>22</sup>. In Table II are reported the studies in literature.

## Discussion

Based on wide authors' experience with TEM, achieved by 491 rectal cancer and 569 adenomas Endoluminal Loco-Regional Resections <sup>11,15,28,29,30</sup>. Authors employed TEM to treat Recto-Vaginal Fistula (RVF) in 13 women from 2001 <sup>18</sup>. Nine patients were previously treated elsewhere with trans-perineal direct suture of vagina and rectal wall and four patients had two or three previous surgical attempts by trans-abdominal, trans-perineal approach or both. One recurrence was observed (7%) 30 days after surgery. The recurrence was treated again by TEM, and a re-recurrence was observed 40 days after surgery. Patient, who had an ileostomy, refused to undergo further surgical treatments <sup>18</sup>. Finally in 2015 authors employed TEM for treatment of RUF <sup>27</sup>.

Forty per cent of patients with RUF had an history of radiation therapy (17,8% pelvic irradiation, 29,6% brachytherapy, 42% combination therapy) <sup>1</sup>; in 60% RUF is a complication after major surgery (65%) (prostatectomy 85%, traumatic fistulas 22%. and IBD 6 %) <sup>1,2</sup>.

Only 10% of patients experience spontaneous healing without surgery <sup>1,2</sup>. Nowadays there are many different approaches and techniques for fistula repairing <sup>1,2,7-12</sup> but a definitive treatment is still missing and the choice of treatment is therefore based on the surgeon's experience. Each procedure differs from the others and the choice ranges not only between different techniques, but also between different approaches: trans-perineal, trans-sphincteric, trans-anal, trans-abdominal with an overall success rate of 87.5% The most frequently used surgical technique is the tissue flap interposition (graciloplasty, rectal or omental flap) <sup>1,2,8-12</sup>. Such procedures, despite the good rate of efficiency, are often very invasive and debilitating, burdened with considerable postoperative morbidity <sup>1,2,7,8</sup>. The ideal treatment should ensure correct hemostasis and provide the removal of the fistula in order to carry out the sutures on healthy tissue with an adequate vascularization. It is also important to obtain a tension free suture line in split level in order to avoid postoperative leakage. The stoma creation allows to protect the healing fistula, reducing local inflammation and preventing infections, but it impacts considerably on patients' QoL <sup>30</sup>. However it seems to be useful to perform a stoma as a first step to increase the success rate <sup>13,31</sup>. Nevertheless three of the patients analyzed (16.7%) underwent TEM without stoma <sup>21,22,24</sup>. In Wilbert series the use of fibrin glue allows to exploit its known qualities as hemostatic, adhesive and sealant, promoting healing and preventing leakage of suture <sup>21,32</sup>.

The traditional transanal approach has a lower success rate (59%) compared with other approaches as trans-perineal (90%), trans-sphincteric (90%) or trans-abdominal (87%) <sup>1</sup>.

TEM is not frequently used in the treatment of RUF and there is not a standardized technique, but anyway there are slight differences reported in literature <sup>18,21-27</sup>. After reviewing the literature authors have focused some key points for the success of the procedure, that are important to emphasize in order to increase the healing success rate by TEM (Table III). The most important point is to remove completely the scar tissue in order to carry out the suture on healthy margin with an adequate vascularization without inflamed tissue. Hemostasis should be accurate in order to avoid postoperative bleed-

TABLE III - Key points for healing of Recto-urinary fistula by TEM.

### Treatment of RUF: Key Points

Oostomy
Complete resection of scar tissue of fistula
Vital and healthy tissues
Accurate hemostasis
Undermine the rectal wall margins
Tension free suture lines in different planes
Fibrin glue apposition (not mandatory)

ing that can lead to hematomas and/or abscesses increasing the risk of dehiscence. It is crucial to undermine the margins of the rectal wall in order to obtain a tension free suture line, preferably in split level. Fibrin glue, apparently, can be useful due to its excellent haemostatic, adhesive and sealant capacity.

Despite good results reported, a healing treatment in irradiated patients seems still difficult to achieve. According to Kanehira et al. the recurrence rate appears to be higher both in patients treated with traditional approaches and in patients treated by TEM, due to extensive tissues fibrosis and a reduced capacity of tissue repair<sup>26</sup> On the other hand standard approaches seems to lead to an higher rate of success than TEM (trans-perineal, 90%, trans-sphincteric, 90% or trans-abdominal, 87%<sup>1</sup>), but obtained through more invasive approaches, very debilitating for the patients, with considerable postoperative morbidity<sup>1,2,7,8,19</sup>.

## Conclusions

The treatment of RUF by TEM is safe and with a high overall success rate (77,8%) and seems to be a viable alternative to traditional methods due to its well recognized technical advantages. TEM allows to treat with successful results even patients who underwent previous surgical attempts of repair, despite the presence of fibrosis or inflamed tissues. More studies and cases reported are still necessary to verify these results.

## Riassunto

**INTRODUZIONE:** Le fistole Retto-Urinarie (RUF) sono una rara complicanza della chirurgia pelvica. In letteratura sono stati descritti differenti approcci chirurgici, ma non è stato ancora stabilito un trattamento definitivo. La Transanal Endoscopic Microsurgery (TEM) è un approccio mini invasivo che permette di operare con una visione magnificata in tre dimensioni. Scopo di questa review è di riportare l'evidenza corrente in letteratura riguardo la tecnica e i risultati ottenuti nel trattamento della RUF con la TEM e di suggerire dei punti chiave per il suo corretto trattamento.

**MATERIALI E METODI:** Dopo una ricerca medline nei database di Pubmed e Scopus, sono stati evidenziati sette lavori: i dati sono stati valutati sulla base dei casi riportati, sulle caratteristiche dei pazienti, sulla tecnica chirurgica utilizzata e sui risultati.

**RISULTATI:** In letteratura tra il 1996 e il 2015 sono stati riportati 18 casi di fistola retto-urinaria trattati mediante approccio TEM. Il tasso di successo è stato del 77,8%. Prima del trattamento nell'83% dei pazienti è stata confezionata una stomia di protezione, mentre il 94% presentava un catetere vescicale a permanenza. In 4 pazienti, già precedentemente trattati chirurgicamente o sotto-

posti a terapia radiante, è stata documentata l'insorgenza di recidiva.

**DISCUSSIONE:** Il trattamento ideale della RUF dovrebbe garantire la resezione completa del tessuto cicatriziale intorno alla fistola, eseguendo la successiva sutura su margini sani adeguatamente vascolarizzati e senza tensione, su due diversi livelli, sul versante rettale e vescicale. La presenza di una stomia consente di proteggere la fistola in guarigione, riducendo l'infiammazione locale e prevenendo le infezioni.

**CONCLUSIONI:** Su questo argomento non vi è ancora consenso in letteratura. Pertanto, chiarire quale possa essere il miglior trattamento è una condizione fondamentale, considerando l'alto tasso di recidive delle varie tecniche proposte. Il trattamento delle recidive, inoltre, ha un tasso di riuscita inferiore rispetto al trattamento primario, nonostante siano richiesti ancora ulteriori approfondimenti per confermare questi dati.

## References

1. Hechenbleikner EM, Buckley JC, Wick EC: *Acquired rectourethral fistulas in adults: A systematic review of surgical repair techniques and outcomes*. Dis Colon Rectum, 2013; 56(3):374-83.
2. Kitamura H, Tsukamoto T. *Rectourinary fistula after radical prostatectomy. Review of the literature for incidence, etiology, and management*. Prostate Cancer, 2011; 629105.
3. Benoit RM, Naslund MJ, Cohen JK: *Complications after prostate brachytherapy in the Medicare population*. Urology, 2000; 55:91-6.
4. Kleinberg L, Wallner K, Roy J, Zelefsky M, Arterbery VE, Fuks Z, Harrison L: *Treatment-related symptoms during the first year following transperineal 125I prostate implantation*. Int J Radiat Oncol Biol Phys, 1994; 28:985-90.
5. Long JP, Bahn D, Lee F, Shinohara K, Chinn DO, Macaluso JN Jr: *Five-year retrospective, multi-institutional pooled analysis of cancer-related outcomes after cryosurgical ablation of the prostate*. Urology, 2001; 518-23.
6. Theodorescu D, Gillenwater JY, Koutrouvelis PG: *Prostatourethral-rectal fistula after prostate brachytherapy*. Cancer, 2000; 89:2085-91.
7. Choi JH, Jeon BG, Choi SG, Han EC, Ha HK, Oh HK, Choe EK, Moon SH, Ryoo SB, Park KJ: *Rectourethral fistula: Systemic review of and experiences with various surgical treatment methods*. Ann Coloproctol, 2014; 30(1):35-41.
8. Dafnis G, Wang YH, Borck L: *Transsphincteric repair of rectourethral fistulas following laparoscopic radical prostatectomy*. Int J Urol, 2004; 11(11):1047-49.
9. Joshi HM, Vimalachandran D, Heath RM, Rooney PS: *Management of iatrogenic recto-urethral fistula by transanal rectal flap advancement*. Colorectal Dis, 2011; 13(8):918-20.
10. Garofalo TE, Delaney CP, Jones SM, Remzi FH, Fazio VW: *Rectal advancement flap repair of rectourethral fistula: a 20-year experience*. Dis Colon Rectum, 2003; 46(6):762-69.
11. Barisic GI, Krivokapic ZV: *Long-term results of surgically treated traumatic rectourethral fistulas*. Colorectal Dis, 2006; 8(9):762-65.

12. Netsch C, Bach T, Gross E, Gross AJ: *Rectourethral fistula after high-intensity focused ultrasound therapy for prostate cancer and its surgical management.* Urology, 2011; 77(4):999-1004.
13. D'Ambrosio G, Paganini AM, Balla A, Quaresima S, Ursi P, Bruzzone P, Picchetto A, Mattei FI, Lezoche E: *Quality of life in non-early rectal cancer treated by neoadjuvant radio-chemotherapy and endoluminal loco-regional resection (ELRR) by transanal endoscopic microsurgery (TEM) versus laparoscopic total mesorectal excision.* Surg Endosc, 2015.
14. Allaix ME, Rebecchi F, Giaccone C, Mistrangelo M, Morino M: *Long-term functional results and quality of life after transanal endoscopic microsurgery.* Br J Surg, 2011, (11):1635-643.
15. Buess G, Theiss R, Hutterer F, et al.: *Transanal endoscopic surgery of the rectum. Testing a new method in animal experiments.* Leber Magen Darm, 1983; M;13(2):73-7.
16. Buess G, Kipfmüller K, Ibaldo R, Heintz A, Hack D, Braunstein S, Gabbert H, Junginger T: *Clinical results of transanal endoscopic microsurgery.* Surg Endosc, 1988; 2(4):245-50.
17. Lezoche E, Baldarelli M, Lezoche G, Paganini AM, Gesuita R, Guerrieri M: *Randomized clinical trial of Endoluminal Locoregional Resection versus laparoscopic Total Mesorectal Excision for T2 rectal cancer after neoadjuvant therapy.* Br J Surg, 2012; 99(9):1211-218.
18. D'Ambrosio G, Paganini AM, Guerrieri M, Barchetti L, Lezoche G, Fabiani B, Lezoche E: *Minimally invasive treatment of rectovaginal fistula.* Surg Endosc, 2012; 26(2):546-50.
19. Serra-Aracil X, Mora-Lopez L, Alcantara-Moral M, Corredera-Cantarin C, Gomez-Diaz C, Navarro-Soto S: *Atypical indications for transanal endoscopic microsurgery to avoid major surgery.* Tech Coloproctol, 2014; 18(2):157-64.
20. Dietmar U, Joachim R, Gerhard J, Pallua N: *Gracilis muscle interposition for the treatment of recto-urethral and rectovaginal fistulas: A retrospective analysis of 35 cases.* J Plast Reconstr Aesthet Surg, 2009; 62(3):352-56.
21. Wilbert DM, Buess G, Bichler KH: *Combined endoscopic closure of rectourethral fistula.* J Urol, 1996; 155(1):256-58.
22. Quinlan M, Cahill R, Keane F, Grainger R, Butler M: *Transanal endoscopic microsurgical repair of iatrogenic recto-urethral fistula.* Surgeon, 2005; 3(6):416-17.
23. Bochove-Overgaauw DM, Beerlage HP, Bosscha K, Gelderman WA: *Transanal endoscopic microsurgery for correction of rectourethral fistulae.* J Endourol, 2006; 20(12):1087-90.
24. Pigalarga R, Patel NM, Rezac C: *Transanal endoscopic microsurgery-assisted rectal advancement flap is a viable option for iatrogenic rectourethral fistula repair: A case report.* Tech Coloproctol, 2011; 15(2):209-11.
25. Andrews EJ, Royce P, Farmer KC: *Transanal endoscopic microsurgery repair of rectourethral fistula after high-intensity focused ultrasound ablation of prostate cancer.* Colorectal Dis, 2011; 13(3):342-43.
26. Kanehira E, Tanida T, Kamei A, Nakagi M, Iwasaki M, Shimizu H: *Transanal endoscopic microsurgery for surgical repair of rectovesical fistula following radical prostatectomy.* Surg Endosc, 2015; 29(4):851-55.
27. D'Ambrosio G, Intini G, Picchetto G, Balla A, Quaresima S, Paganini AM, Lezoche E: *Treatment of rectovesical fistula by transanal endoscopic microsurgery approach.* Ann Ital Chir, 2015; 86:456-58.
28. Lezoche E, Guerrieri M, Paganini AM, Felicciotti F: *Transanal endoscopic microsurgical excision of irradiated and non irradiated rectal cancer. A 5-year experience.* Surg Laparosc Endosc, 1998; 8(4):249-56.
29. Lezoche E, Guerrieri M, Paganini AM, Baldarelli M, De Sanctis A, Lezoche G: *Long-term results in patients with T2-3 N0 distal rectal cancer undergoing radiotherapy before transanal endoscopic microsurgery.* Br J Surg, 2005; 92(12):1546-552.
30. D'Ambrosio G, Balla A, Mattei F, Quaresima S, De Laurentis F, Paganini AM: *Quality of Life after Endoluminal Loco-Regional Resection (ELRR) by Transanal Endoscopic Microsurgery (TEM).* Ann Ital Chir, 2015; 86:56-60.
31. Ommer A, Herold A, Berg E, Fürst A, Schiedeck T, Sailer M. *German S3: Guideline: Rectovaginal fistula, GMS German Medical Science.* 2012, Vol. 10, ISSN 1612-3174.
32. Spotnitz WD: *Fibrin sealant: Past, present, and future. A brief review.* World J Surg, 2010; 34(4):632-34.