Chances and challenges of combined antegrade and retrograde endoscopic recanalization of complete hypopharyngoesophageal obliteration: a case series

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Abstract

Background: Complete hypopharyngeal obliteration is a serious problem after radiochemotherapy. Data on rendezvous techniques using percutaneous retrograde endoscopy through the gastrostomy channel and antegrade laryngoscopy are limited with a possible bias on positive results.

Aim: This study aimed to review the clinical success, challenges, complications, and failure rates of this technique.

Methods: We prospectively collected data on endoscopic recanalization techniques, subsequent bougienages, adverse events, and final outcomes in seven patients.

Results: Recanalization was technically successful in all patients. However, normal food intake was achieved in only two patients, with one of them under ongoing bougienage. Additive treatment was needed in all patients, including microsurgical scar excision, temporary stent application, argon plasma coagulation, and surgical fistula closure. Salvage laryngopharyngectomy had to be performed in two of the seven patients. Preexisting hypopharyngo-tracheal fistula and therapy-induced fistula represent a technically demanding obstacle, necessitating endoscopic stenting and surgical closure.

Conclusion: Endoscopic recanalization of esophageal obliterations is feasible, although technically demanding. The clinical success rate for long-term normalization of oral food intake is, however, low. Prospective data collection in a larger cohort is urgently needed.

Relevance for Patients: Patients should be informed about the possibility of long-term follow-up treatments and the low clinical success rate of endoscopic recanalization by the rendezvous technique, as well as other alternative approaches while making the decision to accept the treatment.

1. Introduction

Hypopharyngoesophageal strictures occur in approximately 3% of patients after radiotherapy for head and neck cancers, squamous cell carcinomas of the upper esophagus, and laryngeal or oropharyngeal cancers [1,2]. A radiation dose >45 – 60 Gy is a risk factor for stricture formation [1,3]. Complete esophageal obliteration has been reported in 23 – 50% of preselected patients with radiation-induced esophageal strictures [2,4]. The most common site for radiation-induced stenosis is the post-cricoid or cricopharyngeal region [5]. In contrast to subtotal esophageal stenosis, which can be easily treated by endoscopic bougienage, complete obstruction of the lumen usually requires alternative approaches, such as surgical revision, which is a complex and difficult procedure in the pretreated proximal esophagus [3,6].
Although some authors advocate surgical reconstruction for complete esophageal obstruction [3,7], peroral and transgastric-retrograde rendezvous has been reported for recanalization of subtotal [8-11] and complete esophageal obstruction in single cases and case series [5,11-19] with a high technical and clinical success rate. However, a positive publication bias should be considered when assessing this technique. Patients with cancers of the hypopharynx are at considerable risk for secondary malignancies of the esophagus [20]. Therefore, re-establishment of the pharyngoesophageal passage will not only allow swallowing of saliva or even restore oral nourishment to improve the quality of life but will also enable endoscopic surveillance in these patients.

Here, we report a case series of seven technically successful recanalizations of complete pharyngoesophageal obstruction after radiotherapy by a transgastric-retrograde approach under transillumination, fluoroscopic, and endoscopic guidance.

2. Methods

2.1. Patients

Seven patients eligible for the combined antegrade and retrograde recanalization treatment presented with complete esophageal obliteration, which was confirmed by upper endoscopy. All patients gave their written informed consent for the treatment and the publication of their data.

2.2. Procedures

For recanalization of the upper esophageal entry, we performed a rendezvous technique: after percutaneous endoscopic gastrostomy (PEG) removal, the PEG channel was dilated to 8 mm (CRE PRO Wireguided Balloon Dilatation Catheter, Boston Scientific, Cork, Ireland), and a slim gastroscopy (GIF XP160, 5.9 mm, Olympus, Hamburg, Germany) was propagated into the stomach and retrograded into the esophagus up to the distal end of the obliteration. Simultaneous transoral endoscopy under fluoroscopy allowed us to measure the length of the obliteration. After endoscopy, the gastroscopy was kept open by a G-tube (Nutricia Flocare Gastrostomy tube, 14 Ch). On the following day (in some cases within the same procedure), antegrade rigid pharyngoscopy and simultaneous retrograde esophagoscopy through the PEG channel were performed under general anesthesia. Under fluoroscopic, transillumination, and retrograde endoscopic guidance, the proximal blind end of the esophagus was punctured from the hypopharynx with a 1.9 mm straightened needle (Provox Vega Puncture Set, Atos Medical GmbH, Troisdorf, Germany) or with the trocar needle of the PEG set in the following cases after cutting the butterfly flanks to straightened needle (Provox Vega Puncture Set, Atos Medical GmbH, Troisdorf, Germany) or with the trocar needle of the PEG set in the following cases after cutting the butterfly flanks to straightened needle (Provox Vega Puncture Set, Atos Medical GmbH, Troisdorf, Germany) or with the trocar needle of the PEG set in the following cases after cutting the butterfly flanks to straightened needle (Provox Vega Puncture Set, Atos Medical GmbH, Troisdorf, Germany) or with the trocar needle of the PEG set in the following cases after cutting the butterfly flanks to

After successful recanalization of the obliterated passage, an average of 30.9 (range 12 – 97) bougienages and balloon dilatations were performed on a weekly or biweekly basis to a final mean diameter of 15.3 mm (range 10 – 20 mm). Additive treatment during bougienage was necessary in six of the seven patients (86%); two patients (#1, #5) needed temporary metal stent implantation (fcSEMS) for fistula with final surgical fistula closure (Figure 3A). Due to the COVID-19-induced restrictions of medical care, one patient (#3) omitted routine follow-up, developed another esophageal occlusion, and needed a second recanalization procedure. Three patients (#4, #6, #7) underwent microsurgical scar excision to improve the entry into the recanalized segment (Figure 3B). Three patients (#1, #4, #5) were treated with argon plasma coagulation for enhanced scar formation and granulation tissue in addition to local triamcinolone treatment (Figure 3C).

After the treatment, all patients could at least consume semisolid food and swallow saliva. Two patients (#3, #5, 29%) resumed normal foot intake and remained PEG-independent, with one of them needing ongoing bougienage. Patient #3 was still under repeated bi- to tri-weekly bougienage, while the other patient (#5) had been healthy, reporting no other complications and needing further bougienages.

2.3. Data collection

Data concerning oncological pretreatment, duration, and symptoms of esophageal obliteration were retrospectively collected from the patient’s file. Data on clinical symptoms at presentation, diagnostic work-up, recanalization procedure, bougienage treatments, complications, symptom development, and final outcomes were prospectively collected during each visit.

3. Results

The clinical background of patients with oncologic details and demographic data are listed in detail in Table 1. The mean and median age was 64 and 70 years, respectively. Most patients (71%) were male. All but one patient received radiochemotherapy for their initial oncological treatment. In all patients, a complete esophageal obliteration occurred with complete aphagia, which was verified by a computed tomography scan, lack of contrast media passage, and upper endoscopy. The mean and median length of obliteration was 16.8 and 20 mm, respectively. Details of the recanalization procedure are given in Table 2, and the standard procedure is depicted in Figure 1. The technical success rate of the recanalization procedure in all seven patients was 100%.

Periprocedural complications occurred in only one patient where the preparation needle induced the formation of a 15 mm wide soft-tissue pocket of the esophageal lumen adjacent to the left common carotid artery (Figure 2). To facilitate 6 weeks of pocket obturation by granulation, weekly bougienages under antibiotic coverage were carried out only up to 9 mm, and secretion drainage was ensured by wire-guided insertion of a small gastric tube after each bougienage.

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Table 1. Patients’ characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Patient #1</th>
<th>Patient #2</th>
<th>Patient #3</th>
<th>Patient #4</th>
<th>Patient #5</th>
<th>Patient #6</th>
<th>Patient #7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>73</td>
<td>70</td>
<td>72</td>
<td>31</td>
<td>59</td>
<td>67</td>
<td>74</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>Male</td>
<td>Female</td>
<td>Female</td>
<td>Male</td>
<td>Male</td>
<td>Male</td>
</tr>
<tr>
<td>Tumor (histopathology)</td>
<td>Oropharyngeal carcinoma and synchronous supraglottic carcinoma of the larynx (squamous cell carcinoma)</td>
<td>Oropharyngeal carcinoma (squamous cell carcinoma)</td>
<td>Hypopharyngeal carcinoma (squamous cell carcinoma)</td>
<td>Hypopharyngeal carcinoma (squamous cell carcinoma)</td>
<td>Supraglottic carcinoma of the larynx (squamous cell carcinoma)</td>
<td>Glottic carcinoma of the larynx</td>
<td>Carcinoma of the larynx (squamous cell carcinoma)</td>
</tr>
<tr>
<td>TNM (UICC)</td>
<td>pT2 pN2c cM0 R1 pT2 pN2a cM0 R0</td>
<td>cT4 cN0 cM0</td>
<td>cT2 cN0 cM0</td>
<td>cT4 cN2b cM0</td>
<td>pT3 pN3b cM0</td>
<td>cT3 cN0 cM0</td>
<td>cT3 cN0 cM0</td>
</tr>
<tr>
<td>Oncological treatment modalities</td>
<td>Total laryngectomy and partial resection of oropharynx, reconstruction, aRCHT</td>
<td>pRCHT</td>
<td>pRCHT</td>
<td>ICT + pRCHT</td>
<td>Total laryngectomy with neck dissection</td>
<td>Tumor debulking, pRCHT</td>
<td>pRCHT</td>
</tr>
<tr>
<td>Additional neoplasia</td>
<td>NCSLC*, pT4 cN2 cM0 (RCHT 45Gy) Skin cancer (squamous cell carcinoma, head/neck) pT1 pNx R0</td>
<td>Prostate cancer, pT3 pN0 R1 (radical prostate resection) Squamous cell carcinoma esophagus* 20 cm from incisors (RCHT)</td>
<td>NCSLC, cT2 cN2 cM0, synchronous (RCHT)</td>
<td>None</td>
<td>None</td>
<td>None.</td>
<td>None</td>
</tr>
</tbody>
</table>

Abbreviations: NCSLC: Non-small cell lung cancer; RCHT: Radiochemotherapy; TNM: Staging according to T=Primary tumor, N=Lymph node metastases, and M=Distant metastases. UICC: Union International Contre le Cancer (International Union against Cancer).

Table 2. Synopsis of treatment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Patient #1</th>
<th>Patient #2</th>
<th>Patient #3</th>
<th>Patient #4</th>
<th>Patient #5</th>
<th>Patient #6</th>
<th>Patient #7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of obliteration (mm)</td>
<td>20</td>
<td>8</td>
<td>20</td>
<td>30</td>
<td>5</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Means of recanalization</td>
<td>Ring cutter, ERC-Balloon 7 mm, bougienage 7 mm</td>
<td>Ring cutter, bougienage 5 mm</td>
<td>ERC Dilatator (7F), bougienage 9 mm</td>
<td>ERC Dilatator (10F), bougienage 5 mm</td>
<td>Ring cutter, bougienage 5 mm</td>
<td>EUS cystotome (10F), bougienage 7 mm</td>
<td>ERC Dilatator (6F), bougienage 5 mm</td>
</tr>
<tr>
<td>Technical success of recanalization</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of bougienages/balloon dilatations</td>
<td>8/5</td>
<td>18/4</td>
<td>12</td>
<td>50/47</td>
<td>28/11</td>
<td>17/4</td>
<td>7/5</td>
</tr>
<tr>
<td>Final diameter (mm)</td>
<td>10</td>
<td>18</td>
<td>15</td>
<td>16</td>
<td>12</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>Additional measures</td>
<td>Three fcSEMSs, surgical fistula closure, APC</td>
<td>RCHT for secondary tumor</td>
<td>Reopening due to re-occlusion</td>
<td>Microsurgical scar excision, triaminolone, APC</td>
<td>fcSEMS, APC, surgical fistula closure, triaminolone</td>
<td>Microsurgical scar excision</td>
<td>Microsurgical scar excision</td>
</tr>
<tr>
<td>Final outcome</td>
<td>Deceased 3 month after last fcSEMS implantation</td>
<td>Laryngectomy rejected by patient, palliative care for osteolytic infection</td>
<td>Normal eating, PEG removed</td>
<td>Salvage laryngopharyngectomy for esophago-tracheal fistula</td>
<td>Bougienage ongoing, PEG-independent</td>
<td>Bougienage ongoing, PEG-dependent</td>
<td>Salvage laryngopharyngectomy</td>
</tr>
</tbody>
</table>

Abbreviations: APC: Argon plasma coagulation; fcSEMS: fully covered self-expanding metal stent; PEG: Percutaneous endoscopic gastrostomy; RCHT: Radiochemotherapy.

no other treatments, for 958 days after her last bougienage. One patient died shortly after recanalization from lung cancer (#1). One patient (#2) was treated with definitive radiochemotherapy for a secondary poorly differentiated esophageal squamous cell cancer, detected 495 days after recanalization. Externally performed radiotherapy overlapped with the initial radiation field, resulting in esophageal wall necrosis with osteomyelitis and spinal metal implantation (Figure 4A). The patient was lost.
to follow-up in this palliative setting. Two patients needed salvage laryngopharyngectomy operations: One (#7) decided in favor of an operation after 12 dilatation sessions failed to bring clinical improvement. Another patient (#4) developed a therapy-induced esophago-tracheal fistula (F - fistula, E - esophagus, Figure 4B) and failed to achieve therapeutic success after a long-term bouginage of 97 treatment sessions.

4. Discussion

Recanalization of obliterated esophageal stenosis is a complex multidisciplinary procedure and requires unconventional and individualized solutions to a multitude of problems and complications. Compared with combined ante- and retro-grade recanalization, antegrade endoscopic recanalization results in less complications but involves a longer intervention time [21]. Nevertheless, we are concerned that the previously reported positive clinical results of the procedure might be overstated due to a positive publication bias.

The reported median length of reopened obliterations was 23 mm with a wide range of 2 – 55 mm [18]. The reported primary technical success rates for recanalization of complete obliterations were high: 18/19 patients [18], 5/6 patients [22], 5/5 patients [13], 7/8 patients [19], and 11/11 patients (with 21 procedures) [21]. In our series, all obliterations were successfully recanalized.

There is a high variability in the used techniques and material in our series as well as in published cases. For puncture of the obliterated tissue, endosonography needles have been reported to be challenging due to their high flexibility [13], but have been successfully applied by others [18]. We attempted applying an ultrasound needle (19G, Olympus EZ Shot) in only one patient, but the tractability of the needle was too high for successful puncture, possibly resulting in a pocket formation.
due to repeated maneuvers with the endosonography needle (patient #4). Needle knife preparation [18] and puncture with the hard end of a wire [22], as well as puncture with a trocar needle from the pharyngeal side [14], as in our cases, have also been reported. Using a stiff needle for puncture from the pharyngeal site offers some advantages regarding maneuverability, especially in obliterations over a longer distance, but still harbors the risk of injuring adjacent and vulnerable structures. Blunt preparation from the oral side under fluoroscopic and endoscopic guidance and puncture of the remaining short segmented soft tissue might be preferable in short-distance occlusions.

Insertion of a feeding tube until repeated bougienages [18] or even the temporal placement of a small-diameter covered metal stent (≤10 mm) [13,14] has been reported as approaches to keeping the pharyngoesophageal passage open after recanalization. However, immediate metal stent insertion did not seem to reduce the necessity of subsequent and repeated bougienages but was associated with a higher abscess formation rate [13]. In this case series, fully covered self-expanding metal stents (fcSEMSs) were used only when fistulas coexisted with the recanalized pharyngoesophageal channel and they did not reduce the need for repeated bougienage. From our experience, the insertion of a gastric tube as a placeholder is highly recommended until the lumen is stable enough to prevent reocclusion. To maintain a functional passage, patients needed up to 32 [18] or even 37 bougienages [4]. In this case series, up to 97 treatment sessions were performed on one patient who did not agree to salvage operation. An overall complication rate of 11% was reported in the literature for the applied rendezvous technique [15]. It has been reported that mediastinal emphysema [22], pneumothorax [12], pneumomediastinum with periesophageal abscess formation and cervical osteomyelitis, cervical abscess formation [13], and microperforation [19] are mainly managed conservative mode.
Definitive radiochemotherapy, 18. In one recent case report, 15.4. In our treatment, 5. or reported 4.

A recent meta-analysis of 19 studies showed a technical success rate of 89%, but a PEG-free improvement of dysphagia in only 58% [23]. In our cohort, this rate was even lower, measuring only 14%.

Additional adhesions in the hypopharynx and larynx, pronounced scar formation and propulsive dysfunction hamper a normal act of swallowing even after successful treatment of esophageal strictures [24], and approximately 20% – 60% of patients are still dependent on their PEG after recanalization [4,5,15,18,22]. Advanced laryngeal scar formation might hamper the well-coordinated act of swallowing after recanalization. Concomitant intensive swallowing training is essential for clinical success. In addition, in 43% of our patients, microsurgery with scar remodeling was necessary to restore the best possible anatomy to facilitate food passage into the recanalized esophageal entrance. Argon plasma coagulation had been applied in some cases to reduce excessive scars but might have contributed to the esophagotracheal fistula which formed after 97 bouginages in patient #4, resulting in salvage laryngopharyngectomy. Therefore, ablative techniques must be applied with utmost caution.

Tumor surveillance is an important management aspect for hypopharyngeal cancer patients, as they often harbor risk factors for other malignancies [20,25,26]. In one recent case report, localized synchronous squamous cell carcinomas of the esophagus 22 cm from the incisors and hypopharynx were treated by definitive chemoradiotherapy [27]. Definitive radiochemotherapy in our patient was, however, complicated by impaired wound healing, esophageal necrosis, fistula formation, and osteomyelitis.

This study has several limitations. Despite the prospectively collected data, we had no well-defined criteria for which techniques and material to be used, for the time intervals of bouginage and the additive treatments. Long-term follow-up data are needed to demonstrate a long-term benefit even in the two patients with the best result reported in this series. Due to the rarity of this treatment modality, we were only able to provide data on a very small cohort. We propose to prospectively collect data in a multicenter study designed with a predefined instrumental armamentarium, treatment intervals, and outcome parameters.

Applying alternative endoscopic techniques like the per-oral endoscopic tunneling for recanalization of completely obliterated esophageal obstructions has been reported in literature [28-30]. Although this technique holds huge potential, it is very technically demanding, and more investigations are warranted to validate its technical and clinical superiority over the rendezvous procedure.

5. Conclusion

Reestablishment of the pharyngoesophageal passage in patients with complete obstruction after radiochemotherapy can be achieved by a rendezvous technique of antegrade pharyngoscopy and transgastric-retrograde esophagoscopy. However, these patients require highly individualized treatment and follow-up with the need for interdisciplinary, unconventional, and sometimes highly experimental approaches to manage post-interventional obstacles. Despite successful recanalization, complete normalization of the complex act of swallowing can only be expected in a small percentage of patients, and many patients might need repeated interventions over many years. Thus, before implementing the procedure, patients should be informed of the possibility of long-term follow-up interventions. To avoid reclosure and secondary malignancies, strict and continuous follow-up must be arranged for these patients.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

Author Contributions

Conceptualization: Ronald Koschny, Gerhard Dyckhoff
Data acquisition/clinical care: All authors
Original draft preparation: Ronald Koschny, Gerhard Dyckhoff

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Review and editing: Philippe Federspil, Peter Sauer, Christian Brunner, Peter K. Plinkert, Gerhard Dyckhoff

Ethics Approval and Consent to Participate

Since patient treatment was performed in the context of routine clinical care, prior ethics application was not obtained.

Consent for Publication

Informed consent was obtained from each patient to publish their data anonymously.

Availability of Data

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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