

**UNIVERSITY "LUCIAN BLAGA" SIBIU
FACULTY OF MEDICINE**

**CURRENT STRATEGIES IN SURGICAL RECONSTRUCTIONS OF
THE ESOPHAGUS**

PHD THESIS SUMMARY

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**SIBIU
2014**

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KEYWORDS: reconstruction of the esophagus, transthoracic esophagectomy, transhiatal esophagectomy, morbidity, mortality, survival, esophageal bypass, jejunum free transfer, vascular augmentation.

PHD THESIS SUMMARY

INTRODUCTION

Surgery of the city Targu Mures recorded a significant tradition in the practice of esophagus interventions, tradition that spans on a period of more than 5 decades. In the '70s, the Surgical Clinic I of Professor Bancu (of which it was also split our service), is among the few centers in the country practicing plasty of esophagus: Ivor Lewis operation, Gavrilu procedure and coloesophagoplasty.

PhD thesis aimed to achieve a synthesis of the main esophageal reconstruction methods used during the period studied within our service, analyzing their indications, surgical technical features, postoperative morbidity and mortality, prognostic and survival factors. Based on the finding that a major source of complications is the anastomotic leak, we analyzed the role of vascular factor in ensuring the viability of esophageal substitute.

The special part of the thesis analyzes the esophageal reconstructions performed within 2nd Surgical Clinic Tg.Mures on a period of 16 years. In a first chapter of this part we comparative analyzed the results after two types of esophageal resection routinely performed in our service: transthoracic versus transhiatal esophagectomy; the results of this study were published by the author and collab. in extenso, in the Journal of Surgery Iasi (2008) and subsequently in the Journal of Surgery (2013, in press). A second chapter of the special part analyzes the results of esophageal reconstruction after bypass operations for caustic stenosis or inoperable esophageal cancers; the author and collab. have used this research by publishing two articles in the Journal of Surgery Iasi (2010, 2013). Based on experimental studies previously conducted in our department, in the reviewed period we performed three esophageal reconstructions that used techniques of vascular surgery: two case reports were published by the author and collab. (Journal of Surgery Iasi, 2007, 2008) and are presented in a series of cases in Chapter 6 of this thesis.

A. GENERAL PART : CURRENT STATUS OF RECONSTRUCTIVE SURGERY IN ESOPHAGEAL STENOSIS

In the general part of the thesis, based on existing literature data and personal experience, I have proposed the achievement of a synthesis on the evolution and current state of esophageal reconstructions. They are analyzed those situations where it is necessary to replace the esophagus; some considerations were possible for micro-surgical reconstructions, too, which are based on an experimental study partially reproduced by permission of the author and on a modest clinical experience of our surgical service.

Pathology for which were imposed esophagoplasties is varied, in the vast majority of cases involving patients diagnosed with esophageal cancer or caustic stenosis. Some reconstructions were performed successively to a esophageal resection, other as bypass interventions for inoperable tumors or post-caustic stenosis.

For the replacement of the resected esophagus it is used the whole stomach, gastric tubes, colon, jejunum and free revascularized grafts. Choosing the appropriate esophageal substitute has a major importance, the decision being influenced by the proposed intervention, the anatomical features of the organ, the specific case and not at least by the experience of the surgical team.

Being a large-scale surgery, after esophagoplasty may occur multiple complications, specific to each type of intervention; when the reconstruction follows to an esophageal resection, the specific complications of both procedures cummlate. The most common sources of morbidity are respiratory complications and anastomotic leaks.

Esophageal anastomosis is recognized as one of the riskiest anastomosis found in the digestive tract surgery. Anastomotic fistulas occur with an increased frequency compared with other digestive fistulas and they are a major cause of complications and deaths after esophageal reconstructions. Mediastinitis and sepsis condition due to anastomotic dehiscences

are a source of serious postoperative complications, followed by high mortality, which is why, in some situations, especially in intra-thoracic anastomotic dehiscences, an aggressive surgical treatment is required. The vascularization of the esophageal substitute is crucial for the proper healing of the anastomosis. Esophagoplasty techniques, even conducted in compliance with indications and under impeccable technical requirements, make inevitable a reduction of the graft's vascularization, which can be aggravated by postoperative hemodynamic changes. Fortunately these changes go in most situations, unnoticed, but it is recognized that any statistics on esophagoplasty does not report the absence of anastomotic fistulas. Improving vascularization using microvascular techniques is considered today as one of the most effective ways to prevent fistulas after esophagoplasty, recognizing the fundamental role of circulatory deficit in the viability of esophageal substitute, as driver of a malfunction, anastomotic fistula and in severe cases of esophageal graft necrosis .

In these techniques, along with pharyngoplasty with revascularized jejunal free loop in the cervical region, which tends to become an elective reconstruction in hypo-pharyngeal cancer, technique of microsurgical revascularization of the traditional esophageal grafts, the so-called "supercharge" procedure is gaining more followers; it is raised the question whether future esophagoplasty will require from the start the revascularization of the graft.

B. SPECIAL SECTION : OUR EXPERIENCE IN RECONSTRUCTION OF THE ESOPHAGUS

Although esophageal reconstruction techniques are well coded, we find that for the same disease, the indications to perform a particular procedure and the adopted solutions, varies significantly from one surgical service to another.

In the treatment of benign and malignant esophageal disorders they have been imagined a variety of surgical procedures. In cases of tumors (mostly malignant) were perfected resection and reconstruction techniques including transthoracic esophageal resection by right or left thoracotomy and transhiatal resections without thoracotomy (esophagectomy with manual dissection). Replacement of the esophagus can be achieved using the entire stomach, tube stomach, colon, jejunum and free revascularized transplants. Bypass procedures, including

gastric bypass or retrosternal colic is performed for tracheo-oesophagienne fistulas, of the inextricable esophageal tumors, of a previous esophagectomy without reconstruction, or in obstructions due to caustic ingestion.

Rates of morbidity and mortality after esophageal reconstructions depend on the stage of the tumor, the biological condition of the patient and the surgical team experience. Most common sources of morbidity and mortality are the respiratory complications (pneumothorax, pleural effusion, pneumonia, respiratory failure) and anastomotic fistulas.

Esophageal reconstruction methods involve the achievement of a tubular structure to ensure the food passage in the proximal digestive tract and have a high degree of difficulty, requiring surgical techniques characteristic of multiple surgical fields, often belonging to digestive and thoracic surgery. Some recently developed methods additionally require the collaboration of plastic and / or vascular surgeons. Interdisciplinary creates difficulties in clinical work , the ideal situation is one in which a particular service meets all compartments required for solving these patients, a very difficult goal to achieve in terms of human and material resources .

In the studied cases the indication for reconstruction was based on solving different etiologic disorders, mostly represented by esophageal cancer and caustic stenosis. I have encountered situations where esophagoplasty was performed after a esophagectomy in emergency, for an esophageal perforation or after achalasia.

After a detailed presentation of the used techniques they are analyzed the immediate and remote postoperative results. Finally, they are compared our results with those found in recent specialty literature, by consulting a bibliography material that includes 168 titles.

The main objective of PhD thesis is the evaluation of the main methods of reconstruction used as a means of surgical treatment of benign and malignant diseases of the esophagus, through the experience of 16 years of the 2nd Surgical Clinic, Targu Mures.

Thus, we defined the following hypotheses:

- follow-up the esophageal reconstruction results after resection of the organ and the comparative analysis of the two types of surgery approaches most commonly used: transthoracic versus transhiatal (TTE vs THE).

- analysis of the esophageal reconstruction results achieved as bypass operations in cases of post-caustic stenosis or as a surgical palliative method in the inoperable esophageal cancer .
- contribution of vascular techniques (microvascular) in reconstructive surgery of the esophagus, through the analysis of a series of clinical cases from casuistry of Surgical Clinic II , Targu Mures .

Our *non-randomized observational, retrospective longitudinal* study lasts a period of 16 years and has as main objective the analysis of results obtained after esophageal reconstruction performed in Surgical Clinic II Targu Mures during 1997-2012. Our database initially included **195 patients** to which in the studied period they were made **198 reconstructions** of the esophagus for etiology heterogeneous diseases, but most represented by esophageal cancers and caustic stenosis.

We excluded from the analysis:

- Patients diagnosed with gastro-esophageal junction tumors or tumors of the lower side esophagus, in most cases, adenocarcinomas (29 cases), which during the studied period the types of the applied esophagus resection and / or reconstruction were very different. It is about cases where the surgical contribution was performed sometimes strict abdominal and / or chest or through toracofreno-laparotomy and the methods of esophageal reconstruction were hardly standardized to be included in a meaningful statistical analysis.
- Patients with resections for caustic esophagitis performed in emergency and were NOT followed by a time of reconstruction (5 cases).

After exclusion **161 patients** remained eligible for analysis, for whom in the period 1997 to 2012 have been made reconstructions of the esophagus.

Chapter 4. Esophageal reconstruction after esophagectomy in 16 years casuistry of Surgical Clinic II Tg.Mureş

In this chapter I have retrospectively and comparative reviewed the results of esophageal reconstructions performed after transthoracic esophagectomy (TTE) or transhiatal (THE) practiced in our surgical service during 1997-2012.

In our study predominated thoracic esophageal cancers, for which, during the mentioned period, there were two types of standardized surgery: transthoracic esophagectomy with triple approach thoracic- abdominal - cervical (Mc Keown procedure), respectively transhiatal esophagectomy, abdominal- cervical (Orringer). We excluded tumors cases of esogastric junction, mostly adenocarcinomas, considering that over the 16 years of our study , we found a lack of standardization in the definition of these tumors as well as notable differences in their surgical approach (strictly abdominal or thoracic approach, toraco-phreno-laparotomy). For these reasons our lot included in the first place cases of squamous carcinomas and lesser extent adenocarcinomas. Punctually there were made esophagectomy for benign injuries or esophageal perforation; we have demographically analyzed them (age , gender) , the methods of investigation and the type of resection and reconstruction adopted, but we have not included in survival curves analysis , considering that it would include a selection bias in the general group of patients diagnosed with esophageal cancer.

In our study we found no significant differences between groups with respect to demographics data, but in terms of tumor location - TTE it was preferred for tumors of the upper and middle esophagus, to younger patients with fewer cardiovascular and / or associated pulmonary conditions. Although most patients were operated in advanced stages (80 patients = 76.9% of the studied group), the group operated by transthoracic approach included patients with significantly higher tumors, reaching adventitia or exceeding the organ (T3 or T4) showing nodes metastases and having a lower degree of differentiation compared to group operated by transhiatal approach. I have also found that the surgeries performed by thoracic approach were followed by a significantly higher blood loss compared to THE ($p = 0.0004$), the first ones lasting significantly more ($p = 0.002$), which correspond to data quoted by several authors.

The surgery was considered curative in a few cases due to the advanced stage of the disease , often ascertaining intra-operative the organ overcoming (T4a) and even extension to neighboring structures , pleura , pericardium , diaphragm (T4b) .

Quality of nodal dissection may influence survival, most recurrences in thoracic esophageal bed being actually metastatic lymph nodes. We can not say that we have made an extensive lymphadenectomy; in TTE-group it was performed a lymph dissection of thoracic and abdominal fields , with a median of number of retrieved lymph nodes of 19 , which after several studies can be considered suboptimal .

We identified complications in 85.7 % of patients who were performed TTE and 59.6 % of patients with transhiatal esophagectomy, the difference between the percentages being statistically significant (p- 0.0008). Respiratory complications were statistically significantly more to patients with TTE (p- 0.03) being primarily represented by pleural effusions. In a large proportion were also found the cervical anastomosis fistulas, which are more common in patients with THE, but still not statistically significant; the vast majority were solved conservatively by simple surgical gestures and have not significantly contributed to preoperative mortality, although were late followed by a large number of anastomotic stenosis that required dilatations and surgical plasty. Un opposite effect have had the partial or total transplant necrosis, followed by mediastinitis, severe sepsis and death.

Regarding the in-hospital mortality rates, defined through all deaths occurring within 30 days postoperatively, we are within the limits accepted by the literature.

We were able to follow patients in the study for a period of three years, during which we lost out of records 10 patients (9.62 %). The free interval of disease and survival curves were calculated and represented as Kaplan-Meier curves. The mortality rate throughout the entire period of the study was 83.0 % with a one-year survival rate of 61.7 %, at 2 years of 39.2 %, and at 3 years of 15.1 %, survival average was estimated at 18 months. Mortality was due to loco-regional recurrence and / or systemic (46 cases), medical causes (11 cases), evolution of postoperative complications (7 cases) or undetermined causes (14 cases).

Overall survival curves were somewhat similar immediate post-surgery, becoming divergent after a year in favor of the THE, and thereafter every two years for TTE, but the differences were not statistically significant. Compared with the literature data, our reported overall survival is lower and might be objective explained by the advanced stage of the disease in both groups, the lack of neo-adjuvant therapy, probably suboptimal quality of

limphadenectomy, inconsistency in the oncology treatment surgery and subjectively, through a collaboration patient-physician often deficient, unfortunately specific to our geographic region .

Of all analyzed variables we obtained clear statistical significance when we studied survival according to the categories of T and N.

Despite its limitations, it is a non - randomized study, comprising a relatively small number of patients in each group, presents certain selection biases primarily related to the advanced stage of the disease in patients in the TTE group and did not include as a studied variable pre- and postoperative oncology treatment, we believe it reflects the reality in terms of clinical and therapeutic esophageal cancer (particularly of scuamous cancer), allowing us to form some conclusions:

1. Diagnosis of esophageal cancer in our geographical region it is most often delayed, made in advanced stages of the disease, when the tumor has penetrated the whole esophageal wall or exceeded the organ.

2. Consecutively, the "oncology" esophageal surgery dropped gradually to the radical intervention with extended cervical-thoracic-abdominal lymphadenectomy, reverting to standard esophagectomy techniques, grouped around the two most commonly used surgical approaches: TTE vs THE.

3. Choosing the substitution organ has a major importance, decision being influenced by the proposed intervention, anatomical features of the organ, the specific case and not at last the experience of the surgical team. After resections, the preferred esophageal substitute is the stomach.

4. Being a large scale surgery, they are possible multiple postoperative complications, specific to each type of intervention; when esophagoplasty follows to an esophageal resection, complications accumulate specific both to resection and reconstruction. The most common sources of postoperative morbidity include respiratory complications and anastomotic dehiscences. Transthoracic esophagectomy are followed by a significantly higher number of respiratory complications; anastomosis fistulas are more common after THE.

5. Apparently there are no prognostic difference between the two surgical approaches (transthoracic vs transhiatal) but only a trend toward the improved survival on long term in the group of patients surged by transthoracic approach; overall survival reported by us is lower than the quoted by literature and could be objectively explained by the advanced stage

of the disease target in both groups, the lack of neo-adjuvant therapy, probably suboptimal quality of lymphadenectomy, the inconsistency in the post-surgery oncology treatment, and subjectively by a collaboration patient-physician not often poor, unfortunately specific to our geographic region.

6. Prognostic factors with obvious statistical significance in the esophageal cancer are T and N categories; we also noted prognostic role of the age on diagnosis and the vascular micro-invasion.

Chapter 5. Esophageal reconstructions after bypass surgeries in casuistry 16 years of Surgical Clinic II Tg.Mureş

5.1. Esophageal reconstructions after bypass surgery for caustic stenosis

Post-caustic esophageal stenosis surgery is, with rare exceptions, one elective, reconstructive, addressing either to strictures unresponsive to dilator treatment or to its complications in the form of tracheo-esophageal fistulas, eso-bronchic or mediastinal abscess. There is no consensus on the surgical treatment of caustic stenosis in adults; colonic interposition seems to be the kind of reconstruction preferred by most authors but remains controversial the indication for esophagectomy. Esophageal bypass is a commonly adopted solution to solve surgical esophageal obstruction caused by caustic ingestion in adults; it is the procedure we also describe as the intervention of choice.

Our retrospective longitudinal study **includes 28 patients** with caustic stenosis, 18 women (64.3 %) and 10 men (35.7 %) who, during the period 1997 to 2012 were made 29 of esophagus reconstructions, at the 2nd Surgical Department, Emergency County Clinical Hospital Mureş. Investigation of post-caustic stenosis aimed the specification of anatomical details of stenosis, assessment of biological condition of the patient and the respiratory function.

Choosing the surgery depends on the location and extent of lesions causing the stenosis. Often surgeries are carried out serially, the first stage consisting of a gastrostomy or jejunostomy. In most cases (n = 22) it was used for reconstruction the right ileocolic graft (*isoperistaltic ileocolic plasty*); in 6 cases it was used the *left colon*. The presence of some gastric lesions associated with esophageal lesions, imposed their treatment by gastrectomy associated with

the oesophageal bypass surgery in two cases. When there are not found gastric lesions it can be used isoperistaltic stomach, either as whole stomach, like in Kirschner - Orringer technique or tubed after Akiyama procedure; we used gastric substitution in two cases. The preferred route of ascension the colon was retrosternal; orthotopic route was used in one case after esophagectomy caustic stenosis. The follow up was performed with difficulty; we missed out 8 patients during the first year post-surgery. The remaining patients (n = 19) could be followed for a variable period of time ranging from 2-6 years.

Postoperative complications occurred in 8 patients, the overall morbidity being of 28.6 %. Were noted: 1 case of bronchopneumonia and one fluidopneumotorax, four wound infections (14.3 %) , cervical anastomotic fistula (10.7 %, 3 cases) . Most severe complication was graft necrosis, the incidence being of 7.14 % (2 cases); both transplant necroses occurred after ileocolic plasty. Hospital mortality was of 3.6 % (one death); it was due to sepsis after a cervical anastomotic fistula with important flow.

5.2. Esophagus reconstructions after bypass surgery for esophageal cancer

Esophageal bypass surgeries in the esophageal cancer have the following information: inoperable tumors due to tracheobronchial invasion, aortic and / or mediastinal structures , or the presence of tracheal-esophageal fistula . During 1997-2012, in the 2nd Surgical Department Tg.Mureş were performed **26 palliative esophageal bypasses** on 4 women (15.6%) and 22 men (84.6 %); in three cases bypass was performed after the inoperable tumor was found during thoracotomy. In most cases we encountered squamous cell carcinoma (23 cases), rarely other histological types- adenocarcinoma (2 cases) , carcinosarcoma (1 case) .

For bypass interventions it is preferred the simplest method of plasty , which is why for most bypasses were used orthotopic stomach (22 cases). The colon was punctually used when the stomach could not be used for plasty, exclusively in the form of straight ileocolic plasty (4 cases). In all cases the ascension path of graft was retrosternal; considering the relatively short duration of anticipated survival it shall not be performed the lower esophagus drainage through an additional anastomosis.

A distribution of cases by years shows that after 2006 the number of esophageal bypass

surgeries decreased significantly , probably due to the introduction of more effective and simpler palliative endoscopic methods.

Complications after bypass interventions in esophageal cancer were higher compared with bypasses made in postcaustic stenosis, overall morbidity rate being of 65.4 % (17 cases); there were noted: 9 respiratory complications, one pulmonary embolism , two cases of hemorrhage, respectively a necrosis of transplant. The most frequent complication was cervical anastomotic fistula, seen in 13 cases - 10 after gastric bypass (76.9 %) and 3 after colic bypass. In 6 cases fistula resolved spontaneously; in two patients presenting high debit fistulas, it was tempted its draining by cover with myocutaneous flap of major pectoralis muscle, but the results were unsatisfactory, recourse ultimately to cervical esophagostomy and jejunostomy. Hospital mortality was of 7.7 % (2 deaths) , one of the deaths was due to necrosis of the transplant and one to the pulmonary embolism .

Discussion and conclusions

Both studies, retrospective, non - randomized, include two small series of patients who have been performed esophageal bypass surgeries for different reasons, e.g. postcaustic stenosis , inoperable esophageal cancer. We considered convenient the separate, descriptive and statistics analysis of this experience to avoid a selection bias of common group due to entirely different etiologic nature of these diseases.

In conclusion, we can say that in case of postcaustic lesions can be fixed only general guidelines of conduct adapted to the stage of disease. Lesions of I and II degrees usually heal without sequelae, while lesions of III and IV degree often require supportive therapy and sometimes surgical bypass.

In the acute phase will practice urgent interventions to save the lives of patients: tracheostomy (when are found pharyngolaryngeal lesions) esophagectomy by stripping (in total esophageal necrosis) and gastric resection (till total gastrectomy going, in case of caustic gastric necrosis).

Restoration of the digestive transit immediately after the resection , it is possible in some cases of gastric lesions , but in most cases of severe postcaustic esophagitis, the time of reconstruction will be performed later .

For nutritional imbalances, patients who can not feed themselves will require a gastrostomy or jejunostomy, usually established at the end of the acute phase (three weeks after ingestion) .

Esophageal plasty is performed by at least two-three months , usually in the form of colic by - pass . In our opinion esophagectomy in caustic stenosis should be avoided , being reserved for that category of patients to which it is foreseen a long-term survival and the risk of malignant esophageal scar is real.

Regarding surgical palliation of inoperable esophageal cancers, surgical bypass, sometimes associated with a palliative esophagectomy, remains a solution to combat dysphagia in selected cases. Esophageal substitute preferred in these cases is the whole or tubed stomach, ascended on the neck usually retrosternally .

Chapter 6. The contribution of vascular techniques (microvascular) in surgical reconstruction of the esophagus - clinical cases

In this chapter of thesis we tried an overview of the main techniques of vascular and microvascular surgery already in the surgical arsenal of the centers experienced in reconstruction of hypopharynx and esophagus. We based, along with a rich bibliography , an experimental study conducted by Mr. Dr. Zamfir Dorin and which , with courtesy and permission of the author, I have reproduced in the general section of the thesis, but also a modest clinical experience, translated by the few cases operated on in the 2nd Surgical Department, Targu Mures in the period 1997-2012 and to which the author have participated as a vascular surgeon .

Reconstruction of the esophagus can become problematic when the stomach can not be used as a substitute, in such situations we are forced to turn to the right or left isoperistaltic colonic plasty. Although it is a standardized technique, the colonic interposition is recognized as having a significant risk of anastomotic fistula and even ischemic complications aimed to compromise the arteriovenous circulation.

Colonic graft revascularization procedure is not new in the literature, it is also known as the "supercharge" or vascular augmentation, most authors describe it as a viable solution to the impasse in cases where intraoperatively graft ischemia occur.

Free jejunal transfer has become the method of reconstruction after total pharyngo-laryngectomy performed in T3 tumors of postcricoid region or less of the upper esophagus.

The technique was described in 1959 by Seidenberg and collab. and since then it has spread because of its better results compared to other classical methods of reconstruction. In some cases this technique may be also a solution for surgical solving of partial necrosis of gose or ileocolic graft.

Our goal in this chapter of the thesis is to present three clinical cases that were performed esophageal reconstruction that required the use of vascular surgery techniques (microvascular), two cases being previously published by the author and collaborator.

We describe two cases of jejunal free transfer, in which this method was electively used as saving solution, the way out of impasse, in case of a patient who initially used version of esophageal plasty failed. Thus, we described a case in which , in collaboration with a team of ENT surgeons it was performed pharyngo-esophageal reconstruction after a total, circumferential pharyngo-laryngectomy, for a hypopharyngeal squamous cell carcinoma T3, the argument for choosing this type of reconstruction being oncological. The second case describes a desperate situation in which the free jejunal graft was the saving solution after a partial necrosis of a isoperistaltic ileocolonic esophagoplasty .

We used a particular technique of vascular anastomosis, by interposing an autologous vein graft reversed between jejunal and axillary artery or left subclavian, prior venous anastomosis being performed with the left internal jugular vein. Our arguments are different and some may be subjective: lack of operator microscope, mistrust regarding the quality of cervical arterial sources, and why not, the lack of experience in performing microvascular anastomoses. As far as we know the method is not described in the literature, and the explanation may be inferred: in most series of described cases the anastomoses are performed by plastic surgeons trained in microsurgery and by performing end-to- end anastomoses. Our team included two vascular surgeons and manner of revascularization was "borrowed" from this specialty, under the form of axilo - jejunal autologous vein clocking or subclavio- jejunal.

Regarding the revascularization of colic graft we describe the case of a patient with a iatrogenic perforation of the chest esophagus to which the reconstruction, performed upon 6 weeks after emergency esophageal stripping was performed with right isoperistaltic ileocolon; intra-operative it was found the poor vascularization of right colonic graft, so that the ileocolic vessels were anastomosed to the internal mammary. Immediate postoperative and long term outcome was favorable, control arteriography confirming the patency of the vascular anastomosis.

Without claiming some conclusions on this vascular technical augmentation of colonic grafts, we share the view of most authors of that the process must be considered exceptional and reserved for cases where there is an evident intra-operative circulatory deficiency at the end of transplantation, in particular conditions represented by the absence of another substitute of the esophagus. This type of surgery requires mixed teams well trained in performing vascular and sometimes even microvascular anastomoses, the learning curve and implementation of the method on large-scale being difficult. Although there are no studies on large series of patients, it seems that the use of vascular augmentation brings a net improvement of blood to esophageal grafts, and by doing so reducing the incidence of anastomosis fistula and graft ischemic complications.

Chapter 7,8. General discussion and final conclusions

1. Stenosis of the esophagus represents a disease difficult to tackle and often involves diagnostic and therapeutic approaches that lie at the crossroads of many surgical areas: gastrointestinal surgery, thoracic surgery, ENT. Moreover, it may be noted that some reconstructive procedures recently developed, often require the cooperation of plastic and vascular surgeons, besides the mentioned specialties; interdisciplinarity creates difficulties in clinical work, the ideal situation is one in which a particular service meets all required departments for diagnosis and treatment of these patients, a very difficult goal to achieve in terms of human and material resources.

2. The main difficulties encountered in the practice of this surgery are deficient biologically are of patients (esophageal cancer occurs in old age, when there are frequently encountered cardiac functional disorders, and nutritional deficit and respiratory impairment are characteristic of patients with esophageal stenosis).

3. Decisive investigations in the diagnosis process of esophageal stenosis are represented by barium esophagography and esophageal endoscopy; barium passage remains valid especially in the diagnosis of benign stenosis. Computerized tomography examination is of great importance in formulating the surgical indication in esophageal cancer .

4. For reconstruction of the resected esophagus or bypass the esophageal stenosis, it can be used varied anatomic structures, e.g. stomach (whole or tubed), right or left colon, jejunum or free revascularized grafts. Surgical treatment, although well codified, largely depends on the preferences and opportunities of involved service in solving the case; the reconstructive esophageal surgery approach requires a knowledge of all technical variants, whereas the choice of the optimal process can be often an intra-operative decision.

5. Whole stomach (Kirshner - Orringer procedure) or tubed (Akiyama procedure) is the most convenient esophageal substitute and most often used in esophageal surgery, because it has a good blood supply and can be reconnected to the remaining esophagus by a single anastomosis. Among the deficiencies of gastric graft it is noted the increased morbidity through anastomosis fistulas, anastomotic stenosis (which often require re-interventions) as it tends to expand and develop propulsive deficiencies; there are also mentioned the late complications such as recurrent esophagitis, stenosis, ulcers and bleeding.

6. Using the colon as esophageal substitute in malignant obstructions it is recommended in patients with predicted long-term survival. Left colon is preferred due to its smaller diameter, a more constant vasculature favorable and better propulsive capability for solid food. The interpolation of substitutes in the isoperistaltic version is important because it gives less chances of developing functional obstruction or reflux and prevent aspiration.

7. Surgery of post-caustic esophageal stenosis is, with rare exceptions, one elective, reconstructive, addressing either established strictures unresponsive to dilator treatment or its complications (fistula, abscess).

8. There is no consensus on the surgical treatment of caustic strictures of adult; colonic interposition seems to be the kind of reconstruction preferred by most authors but remains controversial the indication for esophagectomy. In our opinion esophageal bypass is an acceptable solution, with good long-term results; esophagectomy may be followed by complications not negligible, being justified only in young patients, where there is a risk of malignancy of the healed esophagus.

9. Right isoperistaltic ileocolic esophagoplasty is of first intention, the left colon is the version of last choice, when other methods of esophageal reconstruction are not technically possible or failed.

10. Although in recent years there have been developed endoscopic techniques in the inoperable esophageal cancer, surgical bypass remains one of the most effective ways to fight dysphagia.

11. Jejunal interposition is indicated primarily for hypopharynx and cervical esophagus reconstruction, after radical resection and tend to be the preferred version of digestive reconstruction in these situations.

12. Vascular augmentation procedures of grafts (supercharge) provides quality esophageal substitute in terms of viability and functionality superior to those traditional.

13. The practice of some reconstructions using microvascular techniques requires highly specialized teams and effective interdisciplinary collaborations.