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ORIGINAL ARTICLE

Oropharynx and hypopharynx reconstruction. What have we learnt?

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KEYWORDS
Reconstruction;
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Abstract
Introduction and objectives: Oropharyngeal and hypopharyngeal reconstructions require significant human and technical resources. This study analysed our reconstruction program over the last 13 years.
Material and methods: Retrospective study in a tertiary reference centre.
Results: Forty-three reconstruction procedures, of which 67.4%(29/43) were microvascular (radial forearm 17, rectus abdominis 10, scapular 1, jejunum 1) and 42.6%(14/43) myocutaneous (pectoralis major 13, latissimus dorsi 1). Of these reconstructions, 83%(37/43) were for oropharyngeal defects and 17%(6/43) for hypopharyngeal defects, with 70%Stage iv (30/43), 26%Stage iii (11/43) and 4%(2/43) Stage ii. Mean Hospital stay was 54 days. Complications were present in 74.4% (32/43), salivary fistula being the most frequent (62.5%; 20/32). Ischemic necrosis was present in 20%(6/29) of the microvascular flaps. One microvascular flap was performed every 5.5 months, and one myocutaneous every 11.1 months. Previous radiotherapy and salvage surgery did not significantly increase the rate of complications.
Conclusions: Reconstruction of pharyngeal defects is a challenging and demanding task, one that is great when everything runs perfectly and disastrous when failure takes place, mainly for the patient. Disciplines related with head and neck reconstruction should create multidisciplinary teams to increase experience, particularly in centres where the number of patients available makes it difficult to get the expertise and confidence this surgery demands for accomplishing the objectives of patient satisfaction and functional restoration.

PALABRAS CLAVE
Reconstrucción;
Miocutáneo;
Microvascular;

Reconstrucción de orofaringe e hipofaringe. ¿Qué hemos aprendido?

Resumen
Introducción y objetivos: La reconstrucción de orofaringe e hipofaringe demanda importantes recursos técnicos y humanos. El objetivo es analizar nuestro programa de reconstrucción durante los últimos 13 años.

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Orofaringe;
Hipofaringe

Métodos: Se realizó un estudio retrospectivo de 43 procedimientos reconstructivos de orofaringe e hipofaringe realizados entre 1993-2008.
Resultado: El 67,4%(29/43) fueron microvasculares (fasciocutáneo radial 17, recto anterior del abdomen 10, escapular 1, yeyuno 1) y el 42,6%(14/43) miocutáneos (pectoral mayor 13, dorsal ancho 1). El 83%(37/43) eran tumores de orofaringe y el 17%(6/43) de hipofaringe, siendo estadio iv el 70%(30/43), 26%(11/43) estadio iii y 4%(2/43) estadio ii. La estancia media fue de 54 días. El 74,4%(32/43) presentó algún tipo de complicación postoperatoria, siendo la más frecuente la fístula salivar, 62,5%(20/32). El fracaso por necrosis de los colgajos microvasculares fue del 20%(6/29). Se realizó un microvascular cada 5,5 meses, y un miocutáneos cada 11,1 meses. La radioterapia previa y la cirugía de rescate no influyeron de forma significativa en la incidencia de complicaciones.
Conclusiones: La reconstrucción es un reto apasionante y agradecido cuando todo va bien, pero cuando fracasa, es frustrante para el médico, pero mucho más lo es para el paciente. Por ello, la colaboración entre equipos implicados en la reconstrucción de cabeza y cuello es importante sobre todo en centros en los que el volumen de pacientes no permite adquirir, de forma rápida, la destreza y experiencia que este tipo de cirugía requiere.

Introduction

The reconstruction of defects of the oropharynx and/or hypopharynx after cancer surgery is a constant challenge due to the characteristics of patients, associated morbidity and the functional and cosmetic defects that the surgery attempts to correct. It is a major surgery that requires various technical, human and economic resources, as well as appropriate logistic arrangements, both in the surgical and postoperative phases. Its use has become progressively extended both by the good results reflected in the literature[1,2] and by the need for reconstruction in rescue surgery after the failure of non-surgical treatments. Numerous flaps, myocutaneous and microvascular, have been described whose selection depends on the type of defect, the characteristics of the patient and the experience of the surgical team.

Prior to the use of these reconstructive techniques, each patient should be evaluated properly. Both the healing possibilities as well as options for minimising the consequences associated with treatment should be carefully studied.

The aim of this article is to critically review the reconstructive procedures used in the past 13 years, analysing hospital stay, type of operation, flap, complications and evolution. This is done to draw conclusions that allow us to know whether we are achieving the desired objectives, adapting their use for our environment and establishing the changes that should be adopted for improvement.

Material and method

We reviewed the flaps performed between October 1995 and October 2008 in a department of otolaryngology at a tertiary referral level in our region, with a population of 560,000 individuals in the health area. All the medical records were reviewed, collecting tumour location, surgical approach, type of flap, complications and hospital stay. The mean follow-up was 26 months, with a minimum of 6 months.

Results

We treated a total of 43 patients, with a mean age of 54 years (range 37-69), of which 95% (42/43) were males. Microvascular flaps were used for 67.4% (29/43) of the reconstructions and myocutaneous flaps were used for the remaining 42.6% (14/43) (Table 1), all in the same surgical action as the primary resection. In 79% (34/43), the reconstruction was performed as part of the initial treatment; in 21%(9/43), reconstruction was after rescue surgery due to failure of the chemotherapy/radiotherapy (Table 2). The radial fasciocutaneous flap was the one most frequently used in primary surgery and the myocutaneous pectoralis major flap was the most used in the rescue surgery. The main site of the tumours was the oropharynx in 83%(37/43), followed by the hypopharynx in 17%(6/43). The majority were stage IV, 70% (30/43), followed by stage III, 26% (11/43), and 4% (2/43) were stage II (Table 3). The interventions carried out are shown in Table 4.

Mean stay

The mean hospital stay was 54 days (range 15-165) with a median of 43.2 days. Specifically, the stay was 46 days for the myocutaneous and 57 days for the microvascular.

Table 1 Type of flap

Flap	n	%
Wide dorsal	1	2.3
Scapular	1	2.3
Jejune	1	2.3
Abdominal rectus	10	23.2
Pectoralis major	13	30.2
Radial	17	39.5
General total	43	

Table 2 Type of flap according to primary or rescue surgery

Flap	Primary		Rescue	
	n	%	n	%
Wide dorsal	1	2.9	0	
Scapular	1	2.9	0	
Jejune	1	2.9	0	
Abdominal rectus	9	26.5	1	11.1
Pectoralis major	6	17.6	7	77.8
Radial	16	47.1	1	11.1
General total	34	79	9	21

Table 3 pTpN stages

Stages	N0	N1	N2	N3	Total	%
T2	2	3	3	1	9	21
T3	3	5	10	1	19	44
T4	2	3	9	1	15	35
Total	7	11	22	3	43	
%	16.3	25.6	51.2	7.0		

Table 4 Operations performed

Operation	Total
PP	1
TG+PP	1
TL+TG+PP	1
TG	2
TL+TP	2
TL+PP	8
TL+TG	10
M+PP+PG	18
Total	43

M indicates mandibulectomy; PG, partial glossectomy; PP, partial pharyngectomy; TG, total glossectomy; TL, total laryngectomy; TP, total pharyngectomy.

Complications

Some type of postoperative complication was presented by 74.4% (32/43) of patients, the most common being salivary fistula, present in 62.5% (20/32). The incidence of postoperative complications was similar in microvascular reconstruction, 75.8% (22/29), to that obtained with pedicled flaps, 71.4% (10/14). The most feared complication, ischemic necrosis, occurred in 6 cases, 14% (6/43) of the total. All of these used microvascular flaps, with 3 radial, 17.4% (3/17), and 3 of the anterior rectus, 30% (3/10). The failure rate by microvascular flap necrosis was 20% (6/29). The rate of complications depending on the type of flap is shown in Table 5. Prior radiotherapy and rescue surgery had no significant influence on the incidence of complications.

Frequency

At a rate of one reconstructive procedure every 3.6 months, 43 were performed in 156 months. Microvascular procedures were carried out every 5.5 months and myocutaneous every 11.1 months. The most frequently used flap was the radial fasciocutaneous, which was utilised every 9.2 months.

Discussion

It is difficult to assess how much morbidity is caused by a particular surgical resection with respect to another, but the main priority in oncological surgery should always be complete resection of the lesion with adequate safety margins. Once this requirement has been met, we must try to avoid the removal and/or damage to healthy tissue and reconstruct the defect with tissue that is as similar as possible to the tissue resected. The hierarchy of reconstruction options is oriented towards the most suitable procedures in terms of available tissues, with a range that goes from closure by secondary intention to free microvascular flaps, including skin, muscle or bone depending on the specific tissue required.

From the time when microvascular surgery became a standard reconstruction procedure, due to improvements in technique, instruments and training programs in the early 90s, it has grown constantly, increasing the possibilities for reconstruction as well as its functional objectives[3] and future prospects.[4] Current progression is

Table 5 Complications according to type of flap

	Type of flap					
Complication	Pectoral	Scapular	Jejune	Radial	Rectus	Total
Infection				1		1
Dehiscence	1			1		2
Haemorrhage				3		3
Salivary fistula+haemorrhage				3	3	6
Necrosis				3	3	6
Salivary fistula	9	1	1	3		14
Total	10			14	6	30

towards reconstruction with microvascular flaps instead of myocutaneous flaps, although the latter still have their indications.[6] The pectoralis major myocutaneous flap could be considered the key element in head and neck reconstruction until the arrival of microvascular flaps; it still remains essential in the treatment of postoperative complications (fistula, pharyngostoma, dehiscence) and in the coverage of the vascular axis in patients undergoing radical or pre- or post-radiotherapy surgery.[7,8] The use of a pectoralis major myocutaneous flap provides speed and is easily obtained. In addition, this flap is available to a surgeon without special reconstructive training, something to be considered, as microanastomosed flaps involve a complex technique with the participation of specially trained teams and the implementation of rigorous postoperative monitoring,[6] something not available at all centres. However, its volume and the limitation of the rotation arc by its pedicle may hamper reconstruction in limit areas between the oropharynx and the oral cavity because they are not as easily reached as the palate, for example. These flaps are useful in reconstructing the tongue base when the remaining tongue section is wide and maintains its mobility, retaining a hypoglossal nerve. Their use is not recommended in total glossectomies with preservation of the larynx, as posterior muscle atrophy in effect reduces the volume needed for correct deglutition; microvascular flaps of the anterior rectus muscle or forearm lateral flaps are more useful in this type of case.[9] The myocutaneous flap can also be used in extensive skin and mucosal defects, associated with free flaps.[10] Due to its simplicity and results, we recommend its use for reconstruction of hypopharynx defects.[6]

The spectre of failure is perhaps the factor that holds the use of microvascular reconstruction back, because it is an all or nothing phenomenon; and the lesser the experience, the more important this fact becomes.[5] For some, surgeons are considered to have acquired adequate experience in the management of microvascular technique when they performed over 50 microvascular flaps. In other words, surgical experience is the most important independent factor involved in improving the results of this surgery.[5] Until recent years, having a microvascular reconstruction surgeon in an otolaryngology service was an exception, while today it is the rule in those academic centres with training programs in head and neck oncology. In the words of Jatin Shah: "find a good reconstructive surgeon and keep him busy"–and that is the standard pattern in major cancer centres.

The most significant element in our series is that, despite involving severely ill patients with advanced tumours, the rate of complications in our series is too high. It is difficult to compare series due to the heterogeneity of their groups,[3] but the percentage of satisfactory results in microvascular flaps is greater than 95% at the present time, and in myocutaneous it is above 70%.[11] Salivary fistula is the most feared and dangerous complication as it leads to infections, raising the risk of haemorrhage. The rate of salivary fistulas described in the literature is 30%, although most series refer figures around 15%. The lack of pharyngeal mucosa and the presence of vertical sutures in the case of the tubular radial forearm flap in total pharyngectomy reconstruction are cited as the most frequent causes. The most common areas of tension in the pectoralis major flap, especially at the level of the soft palate and the retromolar trigone, are the most common sites for occurrence of fistulas. The presence of fistulas determines the onset of infection, which in turn poses a risk to the viability of the microvascular suture and of the pedicle. It is important to anticipate these complications, especially in patients with prior chemotherapy and radiotherapy, by creating surgical orostomies and a more routine use of muscle covers. The use of the Montgomery salivary tube has been described in hypopharynx reconstruction. It does not reduce the incidence of complications, but it does reduce the intensity and length of hospital stay.[12]

In this series, we performed reconstructive surgery every 3 months, microvascular every 5 months and pedicled myocutaneous every 11 months; a rate well below the recommended one of at least one every month. This is, in the opinion of the authors, the main reason for the poor results obtained. This type of surgery should be performed by teams, given that not only does the surgery require time and effort, but the postoperative control also demands full dedication to patients, requiring surgical review in 6.8% of cases even in teams with success rates over 95%.[13] In principle, the team carrying out the resection should never be the same as the one doing the reconstruction, simply because of physical exhaustion. In hospitals where this type of surgery is done on a regular basis, the reconstruction is done in collaboration with the department of plastic surgery, which is more used to dealing with flaps and microvascular sutures. The otolaryngologist is then the one who fits the flap to the defect, if possible before carrying out the microvascular suture to prevent posterior traction and torsion of the pedicle and anastomosis. We believe that involving professionals who are used to microvascular surgery and committed to the reconstruction of the head and neck area (maxillofacial, ENT and plastic surgeons) is important if we want to reduce surgical time and improve results. This is especially true in hospitals where, as in ours, this surgery is not performed routinely.

In our series, the mean time of resection was 4:30 h and the time of reconstruction with microvascular flaps was 6:15 h. We have succeeded in reducing the operating time of reconstruction, but not the complications.

There has not been a significant reduction in the number of complications over the years, so we cannot consider that our learning curve has reached a plateau. Improving our training curve would imply having a larger number of cases, concentrating the reconstructive needs of services such as plastic surgery, otolaryngology and maxillofacial surgery in a single team. Increasing the number of patients through applying the indications less strictly would not be correct.

Moreover, at the present time in which satisfactory results of reconstructive surgery are highly predictable, the tendency is towards reconstruction using perforator flaps designed to reduce morbidity at the donor site. These flaps include only the skin and subcutaneous tissue, preserving the muscle with its innervation and much of the fascia. The higher surgical complexity and increase in operating time are offset by the pain reduction and the functional

improvement of the donor area.[14,15] The development of these new trends does not imply a new learning curve which, as we have seen the light of the results presented, would mean falling into the same error.

Conclusions

Reconstructive surgery for the head and neck is a procedure requiring high specialisation, habitualness and effort on the part of the surgical team before, during and after the intervention. Before the operation, it is necessary to assess the patient, analyse the healing possibilities, the objective of the reconstruction and the outlook of the patient. During the procedure, the team needs to 1) prepare the surgical plan; 2) have alternative plans for reconstruction and 3) position the patient properly so as not to interfere if there is a simultaneous flap dissection. Afterwards, it is necessary to maintain appropriate medical control (temperature, blood volume, blood pressure, infection) and monitor the flap. The early detection of vascular compromise with a rapid resolution of the problem through surgical exploration can save many flaps in danger of failure. To do this, comprehensive monitoring of the patient must be performed during the first days after surgery.

Reconstruction is an exciting and rewarding challenge when everything goes well, but when it fails, it is very frustrating for the doctor and much more so for the patient. For this reason, we believe the main lesson we have learned from our experience is that collaboration between teams involved in the reconstruction of the head and neck area is especially important in centres where the volume of patients does not allow the skill and experience required by this type of surgery to be acquired quickly. The demand for the human, technical and economic means that these programs require should make us establish, clearly, what the organisational priorities are to better achieve the objectives. These are none other than adequate patient treatment with the lowest possible risk and the maximum possible benefit, within the usual standards.

Conflict of interests

The authors declare no conflict of interests.

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