Value of nutritional support in patients with pharyngocutaneous fistula

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Abstract: Introduction: A prospective and statistic study is presented to evaluate the efficacy of nutritional support in the postoperative care of patients with pharyngocutaneous fistula after laryngectomy. Patients and Methods: All patients who developed pharyngocutaneous fistula after total o partial laryngectomy between 2001 and 2004 were included and assigned to the study group if a supplementary and enteral nutrition was started through the nasogastric tube, and to the control group if a conventional liquid diet was given. Nutrition of patients in the study group was controlled by an Endocrinologist. Results: 32 patients were included (14 in the study group and 18 in the control group). Both groups were similar for all variables measured except for the length of hospital stay (mean difference 31,02 days) and the need for surgical closure (33% in the control group and 0% in the study group). These differences were found statistically significant. Discussion and Conclusions: Postoperative supplementary enteral nutrition controlled by the Endocrinologist reduced the need for surgical treatment of pharyngocutaneous fistula and shortened the stay in hospital of these patients. More studies are needed to prove the efficacy of preoperative nutrition in reducing the incidence of fistula after laryngectomy.

Key words: Laryngectomy. Pharyngocutaneous fistula. Feeding. Supplementary nutrition. Enteral nutrition.

INTRODUCTION

The appearance of a pharyngocutaneous fistula is a frequent postoperative complication that is well known in laryngectomy patients and can have an especially high incidence after the total extirpation of the organ; it constitutes one of the most frequent problems of this surgery.

Treatment of this complication typically consists exclusively of local treatment and the use of compression bandages; reoperation is only necessary in the minority of cases.

Numerous studies have been carried out to identify the factors that lead to the development of haryngocutaneous fistula. Various links have been found, such as the application of radiotherapy prior to surgery, concomitant neck dissection, anemia, or nutritional deficiency.

In this paper we evaluate the influence that some of those factors believed to predispose the appearance of fistulas may have on their evolution once they have already appeared. We have paid special attention to the necessity for surgical closure and to the duration of postoperative care. At the same time we have evaluated the effectiveness of supplementary enteral nutrition controlled by the endocrinologist to improve said progress.

PATIENTS AND METHODS

Patients studied

Between January of 2001 and December 2003, we studied 32 patients who had developed pharyngocutaneous fistula after undergoing partial or total laryngectomy.

They were divided into two groups according to whether or not they would receive enteral nutrition controlled by the endocrinologist; 14 patients were included in the study group (controlled nutrition) and 18 patients in the control group (conventional liquid diet).

Study Design

Type of Study: Prospective and controlled

Objectives and hypothesis: This study aims to evaluate whether or not the factors that lead to the formation of pharyngocutaneous fistula also constitute unfavorable
prognostic factors with respect to their evolution. At the same time we attempt to demonstrate the influence that postoperative enteral nutrition controlled by the endocrinologist may have on said evolution. We worked according to the following hypotheses:

1. Improving postoperative nutritional support immediately reduces the need for surgical closure of the fistulas.
2. Improving postoperative nutritional support shortens the time of hospital stay of patients who develop pharyngocutaneous fistula after laryngectomy.

**Case selection:** All the patients who developed a fistula after undergoing a partial or total laryngectomy during the study period were included in the study and divided into two groups according to whether or not they would receive controlled enteral nutrition. The presence of an intercurrent metabolic or hematological disease that could interfere with the analytical parameters studied was considered a criterion for exclusion from the study, but no patient operated on during this period presented symptoms of this kind.

**Feeding methods used:** A liquid diet made in the hospital kitchen was administered to the control group through an NGT for 7-10 days; subsequently, progressively normal oral feeding was administered. This nutrition was not controlled by the nutrition unit of the hospital, and was the kind habitually given in our department until the carrying out of this study on this kind of patient. Normoprotein enteral nutrition was given to the study group (through NGT for 7-10 days). It was initially administered at increasing flows until tolerance was established; the caloric and proteinic portions were subsequently adjusted on an individual basis, for which it was necessary to use hyper polymeric proteinic formulas in the majority of cases. Subsequently, a progressively normal oral feeding system was established with nutritional supplements. This nutritional support was controlled by the Nutrition Unit of our hospital.

The appearance of pharyngocutaneous fistula determined, in the cases in which a change to oral feeding had occurred, the return to feeding by NGT (normal liquid diet in the control group; controlled enteral feeding in the study group) until its closure.

**Data collected:** The following variables were defined for study:

- Nutrition used (group-defining variable).
- Facts about the tumor: Staging (TNM); original location of the tumor
- Data about treatment: Surgical technique employed; neck dissection; radiotherapy prior to surgery.
- Data about the patient: Age and sex; total proteins; hemoglobin; presence of MD or heart disease.
- Data about evolution. Closure with conservative methods or with surgery; postsurgical infection; duration of postoperative care (from time of surgery to hospital discharge); no. of days between surgery and appearance of fistula; no. of days between appearance of fistula and hospital discharge.

The decision to operate was taken in all cases during a clinical consultation, following common criteria in all patients throughout the period of the study. It depended on the original size of the fistula and, above all, the patient’s failure to hear after closure with conservative methods. The decision to discharge a patient was taken after correct oral feeding was established.

**Statistical analysis**

Employing the variables indicated above, we carried out different comparisons whose results will be detailed later on, and whose statistical significance was studied by means of the following tests:

- Kolmogorov Test (goodness-of-fit and normal test)
- Mann-Whitney U Test (to compare 2 averages)
- Fisher’s Exact test (to compare 2 proportions)
- Kaplan-Meier Method (probability curves with censored cases)

Despite the fact that the goodness-of-fit tests did not rule out normal distribution of the variables being studied, the sample size required the use of a non-parametric test for the comparison of averages, and of Fisher’s Exact test (more conservative than the CHI squared test) to compare proportions.

**RESULTS**

The results obtained for each of the groups are summarized in table 1.

100% of the patients studied were male, with an age range of 42 to 77 (average age: 65). With respect to intercurrent diseases, only one of the patients studied (3.1%) had a personal history of diabetes mellitus and 5 patients (15.6%: 3 in the study group and 2 in the control group) suffered different types of heart disease.

We used biochemistry and the preoperative hemogram to obtain the analytic parameters compared (the value of the total proteins and hemoglobin) as indices of two of the factors classically involved in the development of pharyngocutaneous fistulae (anemia and nutritional protein deficiency). As can be seen in table 1, the averages of both parameters in the two groups were very similar: 13.57 and 13.9 g/dl for hemoglobin in the study and control group respectively; 6.69 and 6.94 g/dl for the proteins.

In all cases the anatomopathological diagnosis was of squamous cell carcinoma. In table 2 we present the data with respect to local extension (T), regional extension (N) and the location of the tumor for each of the two study groups. Long distance metastasis (M) was not found in the preoperative study in any case.
With respect to treatment employed, 4 patients (2 from each group) had only been treated with radiotherapy prior to surgery. 30 patients (93.75%) underwent a total laryngectomy, with or without neck dissection, while partial techniques were performed on two other patients (1 hemilaryngectomy and 1 supraglottic laryngectomy). A partial pharyngectomy was carried out in 3 cases (2 from the study group and 1 from the control group). Neck dissection was carried out on 24 patients (75%), of whom 11 belonged to the study group and 13 to the control group.

**Postoperative evolution**

Surgical closure of the fistula was only necessary in 6 patients (18.8%). These 6 patients belonged to the control group, that is to say, it was not necessary to reoperate on any patient from the study group. These differences were statistically significant (p = 0.024 for Fisher’s Exact bilateral test). The data on these 6 patients is summarized in table 3.

For none of the parameters previously indicated (those predisposing the appearance of fistula) were there any statistically significant differences between those patients on whom we had to reoperate and those whose fistula was closed using conservative methods. However, significant differences were found with regard to duration of postoperative care, which was an average of 89 days for patients who were reoperated on and 35.58 days for those whose fistula was closed with bandages.

**Duration of postoperative care**

In all cases the patient was discharged from hospital once oral feeding had been satisfactorily established, following the same criteria for all patients throughout the duration of the study. As can be seen in figure 1 there are significant differences for this variable between the two groups. These differences (statistically significant with p = 0.03 for the Mann Whitney U test) are due to a great extent to the patients who were reoperated on, given that, without them, the average no. of days spent in postoperative care of the control group drops from 59.17 days to 44.25 days. The average no. of days in postoperative care for the study group was 28.14 days, with which the estimated saving of hospital stay was of 434.42 days for the 14 patients of the group receiving controlled nutrition during the 3 years that the study lasted.

The average no. of days between surgery and the appearance of the fistula was similar for both groups (7 in the study group and 8 in the control group).

If we use the Kaplan Meier method, taking as censored cases those patients who required reoperation, we see how the probability curves for non-surgical closure are clearly different (figure 2), in such a way that approximately a month after the appearance of the fistula this probability is double for patients in the study group.

**DISCUSSION**

The pharyngocutaneous fistula is still the most
Table 3: Patients reoperated

<table>
<thead>
<tr>
<th>Nutr.</th>
<th>Systemic Enf.</th>
<th>Hb</th>
<th>Total Prot.</th>
<th>Age</th>
<th>Radiotherapy</th>
<th>Infection</th>
<th>TNM</th>
<th>Location</th>
<th>Neck dissection</th>
<th>Postoperative days</th>
<th>Postfistula days</th>
<th>Prefistula days</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>N</td>
<td>12.6</td>
<td>7.2</td>
<td>61</td>
<td>N</td>
<td>N</td>
<td>T1N0M0</td>
<td>Glottis</td>
<td>N</td>
<td>26</td>
<td>21</td>
<td>5</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>14.2</td>
<td>7.2</td>
<td>70</td>
<td>N</td>
<td>N</td>
<td>T3N0M0</td>
<td>Subglottis</td>
<td>N</td>
<td>47</td>
<td>41</td>
<td>6</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>11.8</td>
<td>7</td>
<td>70</td>
<td>N</td>
<td>N</td>
<td>T3N3M0</td>
<td>Transglottic</td>
<td>N</td>
<td>108</td>
<td>98</td>
<td>10</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>11.9</td>
<td>7</td>
<td>74</td>
<td>N</td>
<td>N</td>
<td>T2N1M0</td>
<td>Hypopharynx</td>
<td>S</td>
<td>183</td>
<td>181</td>
<td>2</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>16</td>
<td>7.3</td>
<td>47</td>
<td>N</td>
<td>N</td>
<td>T3N0M0</td>
<td>Glottis</td>
<td>S</td>
<td>57</td>
<td>42</td>
<td>16</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>10.5</td>
<td>7</td>
<td>77</td>
<td>N</td>
<td>N</td>
<td>T3N0M0</td>
<td>Glottis</td>
<td>S</td>
<td>113</td>
<td>107</td>
<td>6</td>
</tr>
</tbody>
</table>

frequent postoperative complication of laryngectomy and one of the main causes of reoperation, lengthening and complicating the postsurgical evolution of these patients. While various factors are believed to affect the development of this complication, until the present day no way of reducing its incidence has been demonstrated given that the majority of the determining factors of its appearance are not modifiable (neck dissection, radiotherapy prior to surgery, intercurrent diseases).

The treatment of pharyngocutaneous fistulae involves conservative measures, such as the use of compression bandages and local cures in the majority of cases, but it is accepted that in 15-30% of cases surgical closure is necessary.

Predisposing factors

In numerous studies a series of factors that can influence the appearance of pharyngocutaneous fistula have been determined. Some of these factors are known to also modify its evolution. Said factors include concomitant systemic diseases (heart disease, diabetes, and anemia), nutritional deficiency, and above all neck dissection and/or partial pharyngectomy carried out at the same time as the laryngectomy, and radiotherapy prior to surgery.

In our study we observed that the majority of patients had undergone neck dissection (75%), 12.5% had been treated with radiotherapy prior to surgery,

Figure 1. Postoperative a average duration.

Figure 2. Probability curves for non-surgical closure.
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and 6.25% had undergone a partial pharyngectomy. However, we did not find any relation between these unfavorable parameters and the need for reoperation.

Similarly, we found no relation between the data corresponding to the extension and location of the tumor, the patient’s age, and the average value of total proteins and hemoglobin, and the need to reoperate. However, amongst those patients who were reoperated on we did observe a tendency (albeit not significant) to having a lesser value of hemoglobin (12.8 g/dl in comparison with 13.9 g/dl for those not reoperated on).

No relation was found between postoperative infection and the need for surgical closure. Nevertheless, it is worth drawing attention to the fact that 100% of patients who suffered a postoperative infection after undergoing a laryngectomy in our department during the study period subsequently developed a fistula.

Thus we did not observe in this study a significant relation between the predisposing factors for the appearance of pharyngocutaneous fistula and the subsequent need for reoperation.

However, if we compare the duration of postoperative care of the patients who had one of the predisposing factors with that of those who did not, we can observe a clear though non-significant difference for the non-parametric tests with an average of 49.77 days for the first group and 27.5 days for those with none of the predisposing conditions. If we analyze each factor individually (table 4), we also find a longer duration of postoperative care in patients with a postoperative infection, in those who had previously been treated with radiotherapy (coinciding with the findings of other studies) and in those who had undergone neck dissection during surgery. These differences were not significant for the non-parametric tests with the exception of that found for patients on whom neck dissection had been carried out (p = 0.02 for the Mann-Whitney U-test.

**Influence of controlled enteral nutrition on evolution**

In diverse studies, the influence of the initiation of oral feeding or even the means of administration of the nutrition on the appearance of fistulae has been evaluated. In general, no reason was found to delay it until the 7th-10th day of postoperative care, which is the habitual practice in our environment. However, whether the type of nutrition used plays a part in the development or the evolution of pharyngocutaneous fistulae has yet to be studied. The positive influence of suitable nutrition in the postoperative care of any kind surgery is well known, given that in this situation the energy and protein demands of the organism in recuperation are increased. However, adequate nutrition is even more important in cases of nutritional deficiency or the risk of deficiency, such as those which are present in any oncological patient or in patients with digestive disturbances, circumstances which are frequently found in individuals who undergo laryngectomy for neoplasia of the upper digestive tract.

In these patients, two adverse circumstances are combined: on the one hand they suffer from a disorder common to neoplastic diseases, which causes inefficient metabolism of carbohydrates, a progressive depletion of lipids and an accelerated protein catabolism; on the other hand they suffer from a mechanical disorder that obstructs the ingestion of nutrients. This situation, aggravated by the nutritional deficiency often observed in head and neck cancer patients due to their frequently unhealthy dietary habits, results in a real metabolic crisis at the time of surgery, which adds the excessive energetic and anabolic demand necessary to repair the damage caused to an already problematic situation. During the 3 years that this study lasted, it was necessary to reoperate on 6 patients (18.75%), which offers a value similar to that found by other authors, but not one of them belonged to the study group (controlled enteral nutrition).

The proportion of patients reoperated on depends to a great extent on the criteria used in the evaluation of these patients, given that, while some authors postulate the value of prompt reintervention, others believe the use of conservative measures, which are effective in the majority of cases, to be the best option. In our case the decision to reoperate is made by consensus during a
clinical consultation, and thus the uniformity of criteria for all patients is assured.

As regards the groups belonging to the study, we found that they were similar in all the variables studied except for the group-defining variable (the type of nutrition used), and we observed some statistically significant differences both with respect to the need for surgical closure and the average duration of postoperative care, which showed a clear improvement of the progress in the patients of the study group.

These differences were due above all to the need to reoperate, which considerably lengthened the duration of postoperative care that the patients required.

CONCLUSIONS

In this study we set out to achieve two objectives: to determine whether predisposing factors are also prognostic of the evolution of pharyngocutaneous fistulae, and to evaluate the influence of supplementary nutrition controlled by the endocrinologist on said progress.

With respect to the first objective, we did not find significant differences in the group of patients who had to undergo a second operation, but we did find differences with respect to the average duration of postoperative care in patients who suffered from a postoperative infection, and of those who underwent radiotherapy prior to surgery or neck dissection; the differences found for this last variable were statistically significant.

With respect to the second objective, we observed a considerable and statistically significant reduction (average of 31 days) of the duration of postoperative care prior to hospital discharge, and the need for reintervention (0% in the study group), and thus we conclude that controlled enteral nutrition improves the progress of patients with pharyngocutaneous fistula.

The data obtained in this study allows us to establish a new hypothesis for future studies in which the usefulness of this kind of nutrition in the preoperative care of patients about to undergo laryngectomy to reduce the incidence of pharyngocutaneous fistula should be evaluated.

References