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Alkaline, protein, low-fat and low-acid diet in laryngopharyngeal reflux disease: Our experience on 65 patients

1 | INTRODUCTION

Laryngopharyngeal reflux (LPR) is the back flow of gastric or duodenal contents into the laryngopharynx where it comes in contact with the tissues of the upper aerodigestive tract.[1] Approximately 10% of patients visiting Otolaryngology-Head and Neck Surgery departments would be concerned and LPR is involved in up to 75% of patients with refractory ear, nose and throat symptoms.[2,3] Many factors are involved in the development of LPR including anatomical (gastroeosophageal sphincter incompetence, hiatus hernia), histological (ectopic gastric mucosa in oesophagus) and environmental (stress, diet and lifestyle habits) considerations.[4] It has recently been suggested that diet and lifestyle habits could play a key role in the disease development.[5] Nowadays, LPR treatment is based on proton pump inhibitors (PPIs), diet and lifestyle modifications during a period of 3 to 6 months. Despite efficient treatment, the long-term control of LPR symptoms and signs still remains difficult with 25% to 50% of patients with chronic course.[1] To date, a very few number of studies interested to the impact of diet and lifestyle modifications on the improvement of symptoms, signs and voice quality in LPR disease.[5-7] However, with regard to the significant risk of adverse effects and the increasing cost of long-term PPI prescription,[5,6,8] diet and lifestyle modifications remain an interesting way for short and long-term control of LPR, especially in patients with chronic course.

The aim of this study was to determine how a treatment based on PPIs, alkaline, protein, low-fat and low-acid diet improves LPR symptoms, findings and voice quality in comparison with a PPI treatment without respect of diet.

2 | MATERIALS AND METHODS

2.1 | Ethical considerations

The ethical committee of EpiCURA Hospitals approved this retrospective study (reference: B707201524621).

2.2 | Study design and patients

A retrospective medical chart review of patients who were diagnosed with LPR in three Hospitals (CHU Liege, EpiCURA Hospitals, Belgium) from 2013 to 2016 was performed. LPR diagnosis was based on positive pH impedance metry or the use of Reflux symptom score (RSI>13) and reflux finding score (RFS>7); which were associated with positive pH impedance metry result.[9] As described in a previous clinical study,[2] patients with cofactors able to bias the LPR clinical and voice quality evaluations were rigorously excluded.

According to a clinically validated protocol for the LPR management,[10] patients were treated by a 3 to 6 months course of pantoprazole (20 mg twice daily), diet and lifestyle modifications. Precisely, patients received diet and behavioural recommendations in the form of a recommendation grid (Table 1). The diet was developed by a multidisciplinary team composed of otolaryngologists, gastroenterologists and nutritionists. Experts conducted a careful review of the composition (ie, carbohydrates, lipids, proteins, pH) of the commonly consumed foods in Western Europe. According to these compositions, experts analysed the impact of foods on gastroeosophageal physiology to identify those that lead to gastroeosophageal dysfunction (ie, increased pepsin and acid secretion; slowing digestion; and oesophageal sphincter dysfunction). Adherence to diet recommendations was weekly assessed by the patient throughout the therapeutic course using a point scale ranging from 0 (non-adherent) to 10 (fully adherent). At the end of the treatment, physician and patient reviewed the adherence to PPIs and diet. Patients who did not have to respect the PPI intake were excluded. According to the median calculating, two groups were isolated from the respect of diet and lifestyle modifications (group 1: full respect; group 2: non-compliance of diet and lifestyle modifications).

2.3 | Clinical and voice quality outcomes

The tools used to assess symptoms and signs of reflux were RSI and RFS.[9] Patients fulfilled RSI at baseline and 3 months after the start of treatment. An experienced laryngologist (MK) rated RFS using videolaryngostroboscopy in a blind manner in regard to the patient complaints (RSI). Patients completed the Voice Handicap Index (VHI) throughout therapeutic course. The perceptual voice quality (grade of dysphonia, roughness and breathiness, (GRB scale)) was performed by three experienced speech therapists (with previously described good interrater reliability)[2] Judges were blinded in regard to the time of the recording (baseline vs post-treatment). At baseline and post-treatment, patients produced 3 sustained/a/to measure acoustic parameters using MDVP software (KayPentax®, NJ, USA).

We collected acoustic data to compare the evolution of per cent jitter, per cent shimmer and noise-to-harmonic ratio according to the respect of diet.

2.4 | Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences for Windows (SPSS version 22.0; IBM Corp. Armonk, NY). To assess changes in RSI, RFS, VHI, perceptual voice assessments and acoustic measurements (within-subject factors) between the two groups of patients (between-subjects factor), mixed ANOVAs were performed. A level of significance of 0.05 was adopted. When the Sphericity condition has not been met (significant Mauchly's test), the Greenhouse-Geisser correction was used.

Keypoints

- The respect of diet and lifestyle modifications could be associated with better improvement of laryngopharyngeal symptoms, perceptual dysphonia and acoustic measurements.
- The potential positive impact of alkaline, protein, low-fat and low-acid diet could be explained by many physiological effects on oesophageal sphincter tonicity, acid and pepsin productions, and gastric emptying time.
- Future controlled prospective studies are needed to confirm the potential key role of alkaline, protein, low-fat, low-acid diet and lifestyle modifications in the clinical improvement of patients with suspected LPR disease.

TABLE 1 Recommendation grid (diet and lifestyle modifications)

Lifestyle habits	Foods to favour	Foods to avoid
1. Stress control	1. Meat, fish, chicken, eggs	1. Meat, fish, chicken, eggs
2. Tobacco & other addiction(s) reduction	Fresh & thin fish	Fat fish, fish oil (sardines, cods, herrings)
3. Reduction of size of meals	Shrimps, lobster, shellfishes	Fat chicken
4. Hot lunch in place of hot diner	Chicken fillet (without skin)	High-fat meat
5. Eat slowly	Turkey (without skin and fat)	• *kidneys, bacon, ground meat,* • *Pâté, tripes, lamb* • *Lamb chops, shoulder or legs of lamb* • *Ribs, rib steak* • *Pork chops, roast and shoulder* • *Foie gras*
6. Do not talk while eating	Duck (without skin and fat)	
7. Avoid tight clothing	Low-fat meat	
8. If possible avoid the following drugs: Non-steroidal anti-inflammatory drugs Corticosteroids, aspirin, theophylline, Progesterone, iron supplementation, Calcium channel blockers	• *Veal cutlet, pork tenderloin,* • *Rindless, fatless, cooked ham* • *Steak, fillet, striploin* • *Roast veal, veal chop, horse*	Delis, sausage, salami
	Remove fat from meat	
	Egg white	
	Other:.....	Other:.....
If heartburn	2. Dairy products	2. Dairy products
1. Reduction of overweight	Low-fat cheese	Chocolate, ice cream, whole milk
2. Elevating the head of the bed	Skim milk	Hard cheese, full-fat cheese
	Other:.....	• *Goat cheese, cheddar, Roquefort,* • *Fontina, gruyere, parmesan, munster, etc*
		Other:.....
Laryngopharyngeal reflux treatment	3. Cereals & Starches	3. Cereals & Starches
Drug:	Oat, wheat, cracker, pasta, Wholemeal bread, brown bread, Boiled potatoes, rice, brown rice	Chocolate cookies, peanut, white bread, French fries & frying Nut, cashew, hazelnut
To take: before - during - after	Other:.....	Other:.....
	4. Fruit & vegetables	4. Fruit & vegetables
Meals (circle the adequate response): • Breakfast • Lunch • Diner	Agave, asparagus, Banana, melon Broccoli, celery, fennel Cooked mushrooms Cauliflower, green beans, ginger Turnip, parsley, tofu	Shallot Spicy Onion Chilli Tomato (sauce or raw tomato)
	Other:.....	Other:.....
	Preparation:	

(Continues)

TABLE 1 (Continued)

Lifestyle habits	Foods to favour	Foods to avoid
Drug:	Cooked by steaming or boiling in water	
	5. Beverage	5. Beverage
To take: before - during - after	Chamomile	Strong alcohol, red & rosé wines
	Water, alkaline water	Sparkling beverage (water, soda, beer, etc)
	Appel/pear juices (no sugar added)	Coffee, tea
Meals (circle the adequate response):	Melon/banana juices (no sugar added)	Citrus juices (orange, lemon, grapefruit)
	Other:.....	Other:.....
• Breakfast	6. Greasy substances	6. Greasy substances
• Lunch	Olive oil	Butter, spicy oils
• Diner	Other:.....	Sauces (mayonnaise, mustard, ketchup, etc)
		Other:.....
	7. Sugar	7. Sugar
	Honey	Sweets

Diet and lifestyle modifications.

TABLE 2 Reflux symptom index; reflux finding score; subjective and objective voice quality evolutions in patients treated by proton pump inhibitors and diet (mean values ±standard deviation)

	Group 1: PPIs + Diet			Group 2: PPIs		
Scales	**Pre-treatment**	**Post-treatment**	***P*-value**	**Pre-treatment**	**Post-treatment**	***P*-value**
Reflux Symptom Index	23.50 ± 6.95	5.73 ± 3.94	0.001	21.38 ± 6.15	11.23 ± 6.58	0.001
Voice problem	3.19 ± 1.88	1.12 ± 1.24	0.001	2.59 ± 1.55	1.56 ± 1.39	0.011
Throat clearing	3.35 ± 2.10	1.16 ± 1.43	0.001	3.67 ± 1.56	2.26 ± 1.46	0.001
Post-nasal drip	3.19 ± 1.79	0.88 ± 1.20	0.001	2.23 ± 1.95	1.44 ± 1.59	0.024
Dysphagia	1.42 ± 1.70	0.40 ± 1.08	0.009	1.51 ± 1.60	0.41 ± 1.02	0.001
Coughing post-eating & lying down	2.50 ± 2.18	0.48 ± 0.92	0.001	1.51 ± 1.75	0.74 ± 1.43	0.014
Breathing difficulties	1.50 ± 1.77	0.40 ± 0.91	0.001	1.62 ± 1.76	0.87 ± 1.40	0.017
Troublesome cough	2.85 ± 1.99	0.36 ± 0.75	0.001	2.13 ± 1.82	0.95 ± 1.21	0.001
Globus pharyngeus	2.46 ± 1.99	0.44 ± 0.92	0.001	2.87 ± 1.81	1.46 ± 1.58	0.001
Pyrosis, heartburn & chest pain	2.88 ± 1.95	0.52 ± 0.92	0.001	3.28 ± 1.73	1.46 ± 1.62	0.001
Reflux Finding Score	11.42 ± 3.16	4.85 ± 3.80	0.001	10.38 ± 1.78	5.15 ± 2.99	0.001
Subglottic oedema	0.15 ± 0.54	0.01 ± 0.01	0.157	0.06 ± 0.13	0.01 ± 0.01	0.317
Ventricular obliteration	1.46 ± 1.66	0.56 ± 1.28	0.012	0.92 ± 1.20	0.67 ± 1.16	0.197
Arytenoid/diffuse redness	3.15 ± 1.01	1.60 ± 1.29	0.001	2.97 ± 1.11	1.38 ± 1.23	0.001
Vocal folds oedema	1.42 ± 0.90	0.32 ± 0.48	0.001	1.21 ± 0.77	0.54 ± 0.64	0.001
Diffuse laryngeal oedema	1.27 ± 0.96	0.28 ± 0.68	0.001	1.10 ± 0.97	0.54 ± 0.76	0.004
Posterior commissure hypertrophy	2.15 ± 0.78	1.44 ± 0.92	0.002	2.21 ± 0.66	1.05 ± 0.76	0.001
Granuloma/Granulation	0.58 ± 0.90	0.24 ± 0.66	0.086	0.51 ± 0.89	0.31 ± 0.73	0.206
Endolaryngeal mucous	1.23 ± 0.99	0.48 ± 0.87	0.008	1.44 ± 0.91	0.67 ± 0.96	0.001
Subjective voice quality						
Voice Handicap Index	19.15 ± 17.13	9.46 ± 11.20	0.001	17.11 ± 11.95	10.84 ± 8.86	0.001
Grade of dysphonia	1.54 ± 0.58	0.58 ± 0.50	0.001	1.44 ± 0.55	0.90 ± 0.72	0.001
Roughness	1.23 ± 0.71	0.42 ± 0.58	0.001	1.33 ± 0.70	0.90 ± 0.75	0.001
Breathiness	0.96 ± 0.66	0.38 ± 0.57	0.001	0.77 ± 0.74	0.44 ± 0.72	0.007
Acoustic parameters						
Per cent jitter	2.61 ± 1.43	2.11 ± 1.25	0.028	2.54 ± 1.45	2.55 ± 2.88	0.141
Per cent shimmer	7.30 ± 3.27	5.99 ± 2.31	0.014	6.82 ± 2.47	6.85 ± 3.87	0.538
Noise-to-harmonic ratio	0.19 ± 0.06	0.17 ± 0.04	0.357	0.19 ± 0.07	0.19 ± 0.12	0.627

The pre- to post-statistical analysis was performed using mixed ANOVAs.
PPIs, proton pump inhibitors.

3 | RESULTS

A total of 65 patients were included in this retrospective study. There were 26 patients in group 1 (16 females) and 39 in group 2 (18 females). The mean age of patients in each group was 50.3 ± 15.4 and 52.4 ± 17.6 years old, respectively. At baseline, the characteristics of both groups were similar according to age, gender, RSI, RFS, VHI, GRB and acoustic measurements ($P > 0.05$).

At the end of the treatment, RSI and RFS significantly improved in both groups (Table 2). However, according to our mixed statistical design, the improvement of RSI was significantly better in patients who respected diet (group 1) in comparison with patients who did not respect diet (group 2) with $P = 0.001$. Excess throat mucus and post-nasal drip ($P = 0.003$), coughing after eating or after lying down ($P = 0.015$), and troublesome cough ($P = 0.013$) better improved in group 1 in comparison with group 2. About LPR findings, we found a trend improvement of the scores of ventricular obliteration ($P = 0.05$) and posterior commissure hypertrophy ($P = 0.06$) in group 1 in comparison with group 2.

With regard to the evolution of subjective voice quality; VHI total score, grade of dysphonia, roughness and breathiness significantly improved in both groups (Table 2). The improvement of the grade of dysphonia ($P = 0.010$) was better in group 1 than group 2. The mean values of acoustic measurements (ie, per cent jitter and per cent shimmer) significantly improved in group 1. We did not find statistical acoustic improvement in group 2. The pattern of evolution of acoustic parameters according to the group and the post-treatment comparison of RSI total and item scores between groups are described in Figure 1.

4 | DISCUSSION

Our results demonstrate that treatment with PPI therapy, alkaline, protein, low-acid and low-fat diet is significantly more effective than PPI therapy alone on laryngopharyngeal symptoms and voice quality. These observations can be explained by the multi-tiered impact of foods composing our diet on gastroeosophageal physiology.

First, some studies have found an association between LPR and abnormalities of the tonicity of lower (LES) and/or upper oesophageal sphincter (UES)[8,11] Precisely, the occurrence of transient LES and UES relaxations may be an important causative factor of reflux in a large number of LPR patients.[8,11] The consumption of high protein foods improves the tonicity of both LES and UES while carbonated beverages, caffeine, alcohol, fat and tobacco are known to decrease the sphincter tonicity that promotes LPR and GERD.[8] Second, it has been demonstrated that the development of LPR signs and symptoms is due to the presence of tissue-bound pepsin in the upper aerodigestive tract mucosa that causes depletion of protective cell proteins or mucus, microtraumatisms of the epithelium and local inflammatory reaction.[5,12] Pepsin has a maximal activity at pH

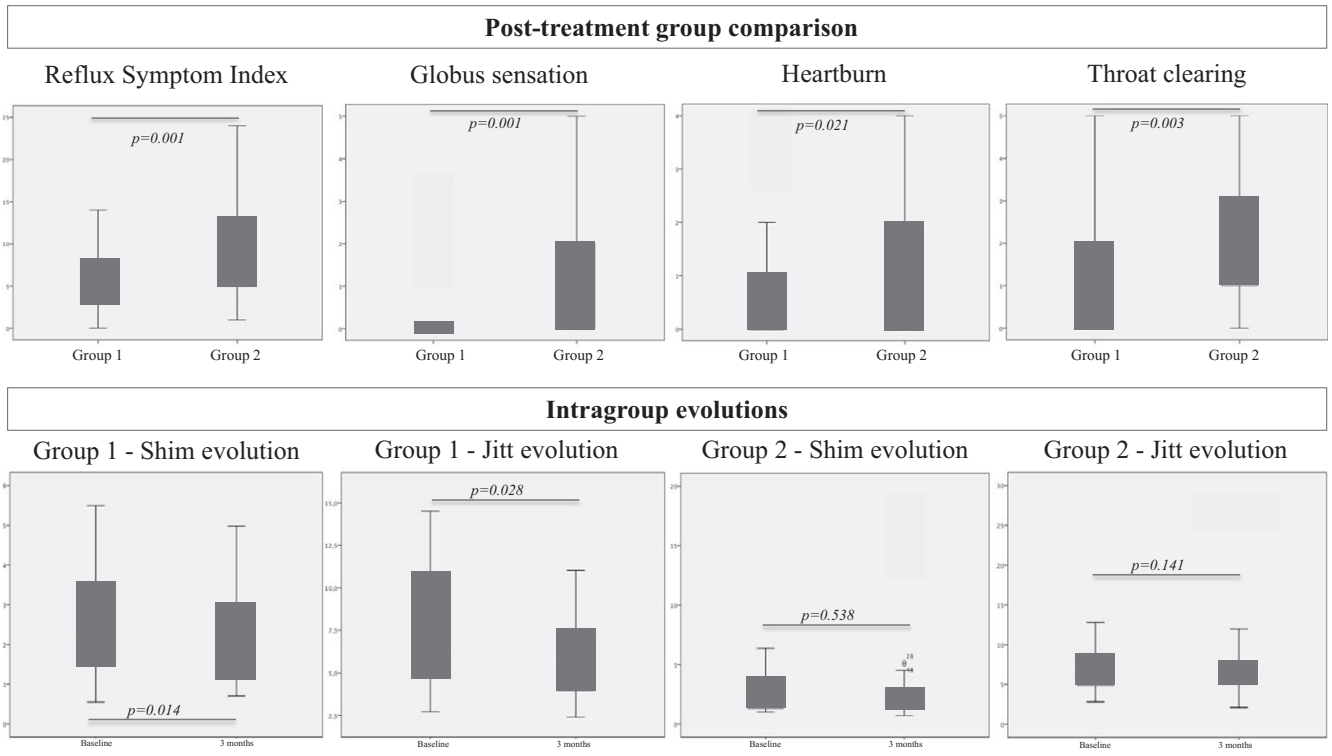

FIGURE 1 Clinical and acoustical differences in LPR patients according to the respect of diet.*Note.* At 3-month post-treatment, patients who respected diet and lifestyle modifications (group 1) had less laryngopharyngeal symptoms (RSI), especially throat clearing, heartburn and globus sensation than patients who did not respect diet and lifestyle modifications (group 2). From baseline to post-treatment time, patients of group 1 had significant improvement of both per cent jitter and per cent shimmer. Acoustic measurements did not change in patients of group 2

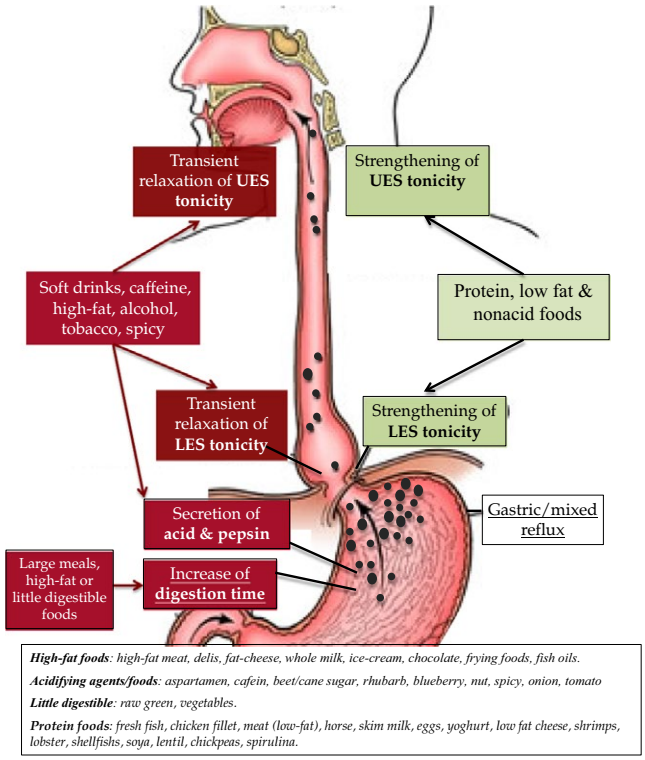

FIGURE 2 Summarise of the diet effect on gastroeosophageal functioning. *Note.* Foods that contribute to the effective gastroeosophageal functioning are marked in green. Foods that alter the effective gastroeosophageal functioning are marked in red [Colour figure can be viewed at wileyonlinelibrary.com]

2.0.[5] Based on these findings summarised in recent reports,[5,12] we have postulated that the intake of acidic foods significantly contributes to the reduction of gastric pH and the occurrence of related reflux episodes. Thus, the reduction of consumption of some acidic foods (ie, spicy, caffeine, beer, chocolate.), the intake of alkaline water, as well as the modifications of some lifestyle habits (tobacco, stress) may significantly increase the pH of refluxed episodes and the related pepsin activity. Third, it has long been recognised that fatty foods and some uncooked vegetables take longer to digest and the delayed gastric emptying time inevitably increases both number and duration of reflux episodes.[8] The digestion process also depends of cooking food. With regard to the pH modification of some acidic foods cooked with water (pH increase), it could be useful to cook acidic vegetables (ie, onions, beans, lentils) than to consume them raw. Fourth, oesophageal motility is another important defensive mechanism against reflux since it allows, in a first phase, rapid elimination of refluxed gastroduodenal contents of the oesophagus, and, in a second phase, the neutralisation of residual refluxed content by bicarbonate in saliva.[8] In that respect, the acidification or the lack of saliva may favour the LPR development. Whenever possible, we carefully excluded drugs associated with modification of the saliva production. Figure 2 summarises the impact of diet on gastroeosophageal physiology.

The main limitation of this retrospective study is the low number of patients that limits us in the highlighting of additional significant clinical and voice quality differences between groups. Moreover, it would have been interesting to have a control group of LPR patients treated with diet without PPIs.

It is important to bear in mind that our diet recommendations were established on Western European dietary and lifestyle habits and we did not include many foods usually consumed in other regions of the world. The establishment of adapted recommendations taking into account the local characteristics of diet makes sense by region. Thus, we could expect to treat some mild and moderate LPR with diet and lifestyle modifications, making substantial drugs economy.

5 | CONCLUSION

Many physicians only prescribe PPIs without consideration for diet and lifestyle changes. The results of this retrospective study support that the addition of diet and lifestyle modifications significantly improves the curative effect of PPIs, especially on laryngeal symptoms, roughness and acoustic measurements. Further prospective studies are needed to better identify the pathophysiological mechanisms underlying the development of LPR according to the diet.

CONFLICT OF INTEREST

None.

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Accuracy of fine-needle aspiration cytology in suspicious neck nodes after radiotherapy: Retrospective analysis of 100 patients

1 | INTRODUCTION

Fine-needle aspiration cytology (FNAC) has been established as a very accurate, safe, time-saving and cost-effective diagnostic tool. As shown in a meta-analysis by Tandon et al,[1] FNAC performed in neck nodes has a high sensitivity (72.4%-100%) and specificity (85.3%-100%) with false positive and negative rates ranging from 0%-27.5% and 0%-14.6%, respectively.

Examination of cervical lymphadenopathy after radiation therapy is known to be challenging, as necrotic tissue is hardly distinguishable from tumour tissue. In this setting, FNAC is able to provide more information as to the presence of benign or malignant cells.

To date, little is known about the diagnostic accuracy of FNAC in patients after primary or adjuvant radiotherapy. Our literature review revealed only few studies analysing the diagnostic value of FNAC after radiation therapy with inconsistent results.[2-7] Therefore, we conducted this retrospective study to determine the diagnostic value of FNAC in patients with suspicious neck nodes after radiotherapy for malignant tumours of the head and neck.

2 | METHODS

2.1 | Ethical considerations

This retrospective study was approved by the Research Ethics Board of the Medical University of Vienna (1261/2016).

2.2 | Patients

A database search was performed at the Department of Otolaryngology, Head and Neck Surgery, Medical University of Vienna, for the period January 2006 to December 2017. 100 patients who underwent FNAC for suspicious neck nodes after radiotherapy were included in this study. All patients had complete