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Cervico-mediastinal Goiter: The Clinical and Therapeutic Aspects

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Abstract: *OBJECTIVES:* Our work aimed to expose the methods of resection of plunging goiters by pure cervicotomy and to compare the results of our study with those of the literature. *MATERIAL AND METHODS:* This was a retrospective study extended over 5 years from January 2016 to December 2020 on the medical observations of 20 cases of thyroidectomy for plunging goiters in the otolaryngology and cervicofacial surgery department of the Gabriel Touré University Hospital of Bamako. *RESULTS*: During our study period, 170 cases of thyroidectomies were performed in the department, including 20 cases of plunging goiters, i.e. (11.76%) surgical goiters. The average age was 43.5 years with extremes ranging from 20 to 80 years. The age group of 40 to 50 years was the most represented. We noted a female predominance with a sex ratio of 0.25. Six patients (30%) had a family history of goiter. The average duration of evolution of goiter was 8 years with extremes ranging from 2 to 17 years. The lower edge of the goiter was not palpable in any of our patients. Chest X-ray was performed in all patients and showed greater mediatisnal opacity in 11 patients (55%), tracheal deviation in 7 patients (35%), and tracheal compression in 2 patients (10%). Cervicothoracic computed tomography was performed in 18 patients, i.e. 90% of cases. The anterior location represented 85% and the posterior location 15%. Plasma thyrocalcitonin was measured in 3 patients, i.e. 15%. All the goiters were extirpated exclusively by the cervical route. Our patients benefited from a total thyroidectomy in 70% of cases (n = 14), a subtotal thyroidectomy in 20% of cases (n = 4) and a lobo-isthmectomy for 10% of patients (n = 2). Dissection of the recurrent nerve was performed retrogradely at its entry point into the larynx in all patients. Accidental devascularization of the lower parathyroids was noted in three patients (15%) and infiltration of the upper parathyroids was noted in 1 patient (5%). Reoperation for totalization was performed in one patient (5%). Lymph node dissection was performed in two cases (10%). Post surgery radiotherapy was performed in two cases (10%). Clinical and biological monitoring was normal in our patients.

Keywords: Cervico-mediasttinal Goiter, Recurrent Nerve, Cervicotomy

1. Introduction

A goiter corresponds to a localized or generalized hypertrophy of the thyroid body [1]. It is usually cervical but can have an intrathoracic development by going beyond the upper orifice of the thorax and descending more or less towards the mediastinum, thus defining cervico-mediastinal goiter [1]. Indeed, the definition of cervico-mediastinal goiter is not unequivocal or consensual. Several criteria have been proposed to define the sinking nature of a goiter: its lower limit is not palpable in the surgical position, has a lower extension more than two fingerbreadths below the

sternal manubrium, requires specific extraction maneuvers [1, 2]. Surgical management of plunging goiters is essentially based on cervicotomy [1, 2]. Associated sternotomy is an exception [3].

The purpose of this work was to expose the methods of resection of cervico-mediastinal goiters by pure cervicotomy through our observations and to compare the results of our study with those of the literature.

2. Material and Methods

This was a retrospective study extended over 5 years from January 2016 to December 2020 on the medical observations of 20 cases of thyroidectomy for cervico-mediastinal goiters in the otolaryngology and cervicofacial surgery department of the Gabriel Touré University Hospital of Bamako. Were included any goiter of which: the lower pole is not palpable on clinical examination, any cervico-mediastinal goiter on imaging, any plunging goiter discovered intraoperatively. We excluded autonomous endothoracic goiters. We studied the following items: age, sex, history, clinical and paraclinical data, intervention data and post-therapeutic monitoring.

3. Results

During our study period, 170 cases of thyroidectomies were performed in the department, including 20 cases of cervico-mediastinal goiters (Figures 1-2) or (11.76%) surgical goiters. The average age was 43.5 years with extremes ranging from 20 to 80 years (Table 1). The age group of 40 to 50 years was the most represented (Table 1). We noted a female predominance with a sex ratio of 0.25 (Table 2). Six patients (30%) had a family history of goiter. The average duration of evolution of goiter was 8 years with extremes ranging from 2 to 17 years. Most of our patients had consulted for cervical swelling (9 patients or 45%), the other reasons were represented in decreasing order by dyspnea (6 patients or 30%), dysphonia (3 patients or 15%), dysphagia (1 patient or 5%) and cough (1 patient or 5%) (Table 3). The lower edge of the goiter was not palpable in any of our patients. Three patients had palpable cervical lymphadenopathy, i.e. 15%. All our patients had benefited from a nasofibroscopy, it normal in all cases. All our patients were in biological euthyroidism. Chest X-ray was performed in all patients and showed greater mediatisnal opacity in 11 patients (55%), tracheal deviation in 7 patients (35%), and tracheal compression in 2 patients (10%). Cervical ultrasound was performed in 16 patients (80%), it confirmed the sinking nature of the goiters in 10 patients (50%). Cervicothoracic computed tomography was performed in 18 patients (Figure 3), i.e. 90% of cases; it made it possible to confirm the plunging nature of the goitre in all cases and to specify its situation in relation to the innominate trunk. The anterior location represented 85% and the posterior location 15%. Cytopuncture was performed in 15 patients; it was suspicious of malignancy in 2 cases. Plasma thyrocalcitonin was measured in 3 patients, i.e. 15%; it was high in one case (5%). All goiters were extirpated via an exclusive cervical approach (Figures 4-5). Our patients benefited from a total thyroidectomy in 70% of cases (n = 14), a subtotal thyroidectomy in 20% of cases (n = 4) and a lobo-isthmectomy for 10% of patients (n = 2). The thyroid glands were approached from the superior pole. Dissection of the recurrent nerve was performed retrogradely at its entry point into the larynx in all patients 5 Figures 6-8). The parathyroids were identified and preserved while respecting their vascularization in 16 patients (80%) (Figure 9). Accidental devascularization of the lower parathyroids was noted in three patients (15%) and infiltration of the upper parathyroids was noted in 1 patient (5%). All surgical specimens were examined by the pathologist. Reoperation for totalization was performed in one patient (5%). Lymph node dissection was performed in two cases (10%), it concerned the compartment and lateral. Post surgery radiotherapy was performed in two cases (10%). Clinical monitoring included cervical palpation of the thyroid compartments and lymph node areas at each consultation, a TSH assay 2 to 3 months after the start of treatment with thyroxine or after each dose change, a cervical ultrasound and a TSH assay. thyroglobulin every year.

Figure 1. *Large cervicothoracic goiter front view.*

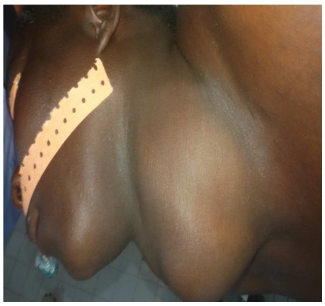

Figure 2. *Voluminous cervicothoracic goiter profile view.*

Figure 3. *Sagittal cervicothoracic CT: cervicothoracic goiter plunging the superior mediastinum in a retrovascular position.*

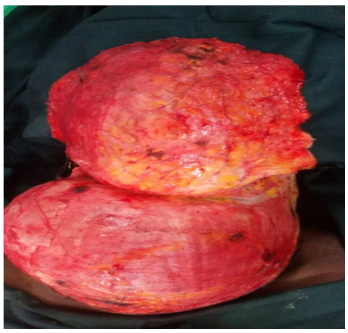

Figure 4. *Wide cervicotomy with flap detachment.*

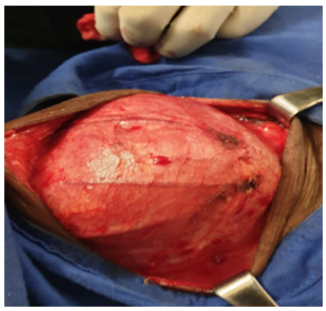

Figure 5. *Wide cervicotomy with flap detachment.*

Figure 6. *Retrograde inferior laryngeal nerve dissection.*

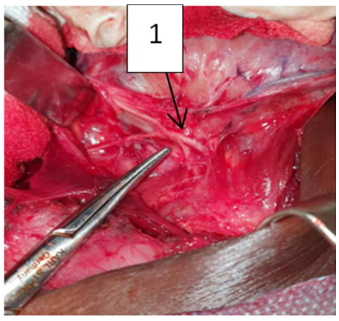

Figure 7. *Retrograde inferior laryngeal nerve dissection.*

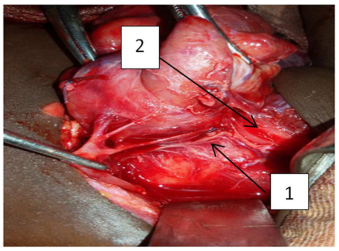

Figure 8. *Retrograde inferior laryngeal nerve dissection 1, inferior pharyngeal constrictor muscle 2.*

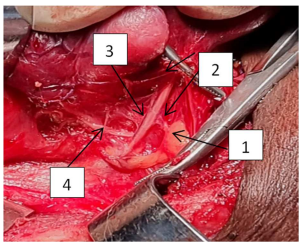

Figure 9. *Right inferior parathyroid 1 with its vascular pedicle 2, inferior thyroid artery 3, recurrent nerve 4.*

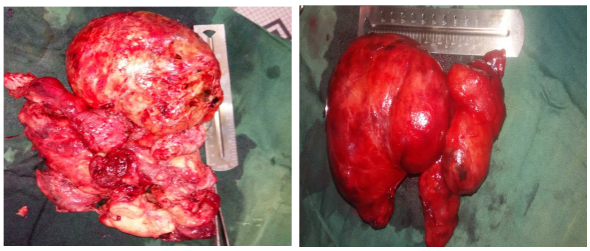

Figure 10. *Total thyroidectomy specimen with lymphadenopathy.*

Table 1. *Distribution of patients according to their age.*

Ages	Effective	Percentage (%)
[20-30 year]	3	15
[30-40 year]	5	25
[40-50 year]	7	35
[50-60 year]	3	15
[60-70 year]	1	5
[70-80 year]	1	5
Total	20	100

Table 2. *Distribution of patients by sex.*

SEX	Effective	Percentage (%)
Feminine	16	80
Male	4	20
Total	20	100

Table 3. *Distribution of patients by reason for consultation.*

Reasons for consultation: symptoms	Effectif	Pourcentages (%)
Anterocervical swelling	9	45
dyspnea	6	30
dysphonia	3	15
dysphagia	1	5
Cough	1	5
Total	20	100

4. Discussion

Our study took place in the reference department of cervical surgery in Mali. Nevertheless, the data that we have collected are not exhaustive since there are other surgical departments that perform thyroidectomy.

The definition of plunging goiter is neither unambiguous nor consensual. Several criteria have been proposed to define the sinking nature of a goiter: its lower limit is not palpable in the surgical position, has a lower extension more than 2 fingerbreadths below the sternal manubrium, requires

specific extraction maneuvers [1, 2]. Other definitions can be found in the literature: goiter in which more than 50% of its mass is located under the upper edge of the sternum, when the goiter reaches the height of T4 on a chest X-ray or when the goiter comes into contact with the aortic arch [3]. An objective and reproducible definition has been proposed by French authors based on data from computed tomography and magnetic resonance imaging attributing the sinking character to goiter whose lower limit reaches or crosses the plane of the vessels under keyboards [3]. Brenet et al. defined it as any cervical goiter emitting an inferior prolongation requiring specific extraction maneuvers likely to increase the surgical risk [4]. The distinction between cervicothoracic plunging goiter and endothoracic goiter developed from ectopic thyroid tissue with no connection to the cervical thyroid is important because their vascularization is different [4]. In our series, any goiter whose lower edge was not palpable was considered to be plunging, the patient in a surgical position, clinically and radiologically, any goiter emitting a lower extension two fingerbreadths below the sternal manubrium.

There is a close correlation between the frequency of cervical goiters and that of plunging goiters, therefore the latter are very common in endemic areas [4]. This frequency is variously assessed by the authors, it varies from 2.5% to 20% of all thyroidectomies [6]. In accordance with these data we found a prevalence of 11.76% of surgical goiters. The average age was 43.5 years with extremes ranging from 20 to 80 years. The age group of 40 to 50 years was the most represented.

Patients generally affected by sinking goiter seem to be older than those with cervical goiters, due to the slow evolution of the thyroid mass during the sinking goiter and its asymptomatic character [7]. The female predominance classically found in the literature was confirmed by our study where we have found a sex ratio of 0.25 [8]. These data confirm the involvement of hormonal factors in the pathogenesis of goiters [3, 4]. The anatomical and topographical conditions as well as the volume of the goiter are all factors that explain the diversity of the circumstances in which a sinking goiter is discovered [8]. These can range from total clinical latency with preoperative discovery, to revealing asphyxia, passing through the discovery during a systematic radiological examination and signs of mediatisnal compression, or thyroid dysfunction [8, 9]. In general, patients presenting with plunging goiter most often consult before the increase in the volume of the gland and the appearance of signs of compression [1, 3, 8, 9]. In our study, the reasons for consultation were dominated by cervical swelling (45%), the other reasons were represented in decreasing order by dyspnea (6 patients or 30%), dysphonia (3 patients or 15%), dysphagia (1 patient or 5%) and cough (1 patient or 5%). Nerve compression, especially frequent in posterior goiters, is not the prerogative of malignant goiters. It can involve the recurrent, cervicothoracic or cervico-brachial sympathetic but also the phrenic nerve [3, 4, 8]. Esophageal compression remains less frequent than tracheal and nerve compression, because the esophagus is willingly pushed back. It results in dysphagia, noted in 5 to 20% of thoracic goiters in the literature [10]. The frequency of venous compression varies from 3 to 19% of cases [10]. It almost always involves the venous trunks of the superior cellar confluence. Signs of venous compression (superior vena cava syndrome) result in an increase in the volume of the neck and more or less developed collateral circulation, the extent of which varies depending on the site of the compression [11]. A careful clinical examination including an interrogation in search of a family history of goiter, a history of cervical surgery, anterior cervical irradiation, signs of compression and dysthyroidism is essential [4-8]. The physical examination including a palpation must look for the limits of the gland and its consistency, a thrill, and the cervical adenopathies. All completed by the Pemberton maneuver which will seek discomfort in venous return, by raising the patient's arms, along their ears, which results in a purple-red appearance of the face [8]. Cervical lymphadenopathy was palpable in 15% of our patients. Although it is less informative than CT and cervical ultrasound, cervicothoracic radiography occupies a dominant place in the diagnosis of submerged goiters [12]. It allowed us to highlight a higher mediatisnal opacity in 55% of cases, a tracheal deviation in 35% of cases, and a deviation and tracheal compression in 10% of cases. First-line imaging is ultrasound, even in the case of clinically manifest goiter [4]. It allowed us to evoke the plunging nature of goiter in 50% of cases in our study. Its interest is above all to guide the cytopuncture and highlight suspicious lymph nodes. The cervicothoracic CT scan with injection of contrast product is the gold standard for cervico-mediastinal exploration [4]. Vascular exploration focuses in detail on the relationship between goiter and the aortic arch, common carotid artery, subclavian artery, brachiocephalic vessels [4]. Its relationship with the innominate vein enables them to be classified as pre- or retrovascular plunging goiter [8]. The anterior pre-vascular forms are the most frequent, they are hampered in their lower development by the brachiocephalic vessels. The posterior forms can reach a more considerable volume because there is a large posterior space, on the other hand, the development on the left will then be blocked by the aortic arch and laterally by the common carotids [4]. In our study we noted 85% anterior localization. In our series, the patients were in biological euthyroidism because most of our patients came either from the endocrinology department or have already been stabilized by medical treatments.

For most authors, the surgical indication is formal in front of a plunging goiter given the risk of acute respiratory distress involving short-term vital prognosis and long-term malignant degeneration [3, 8, 12, 13] For others, age is the first factor to consider. These authors consider that the discovery of an asymptomatic sinking goitre in a subject of physiologically advanced age is not in itself an indication for surgery given the risks associated with surgery [4]. We opted for a formal surgical indication, especially since the ages of the patients in our series were not physiologically very advanced.

Regardless of their volume, cervico-mediastinal goiters can, in almost all cases, be extirpated by pure cervical approach and it is exceptional to have recourse to an additional sternotomy [3, 8, 13].

The indications for sternotomy are limited to goiters with posterior mediastinal extension, recurrent plunging goiters, conical shapes, or in the event of impossibility of excision by cervicotomy [2-7, 9, 11]. In our series, we did not resort to any additional sternotomy. Cervicothoracic goiter surgery is complex and can only be performed in reference centers with experienced surgical and anesthesiological teams [4, 13-15].

Intubation is performed by an experienced anesthetist because, although rare, it can often be difficult to perform [16]. The surgeon must be available during the induction and teamwork with the anesthetist must be optimal. In the event of foreseeable difficulties (with pharyngo-laryngeal involvement or obesity), intubation should be performed with the patient awake, under flexible endoscopy [16].

Cervicothoracic goiter surgery differs from conventional thyroid surgery in a number of ways: retrograde localization and dissection of the inferior laryngeal nerve and upward traction of the goiter to better visualize the inferior thyroid veins [4]. The dissection should begin with the upper pole of the gland on the dipping side. Our first approach to consist of a wide cervicotomy in all cases, the gland was approached by its superior pole. We proceeded to localization and dissection of the recurrent nerve by retrograde approach in all our patients. After ligation of the superior pedicle and identification of the external laryngeal nerve, the lobe is mobilized forwards and downwards [4, 17, 18]. The parathyroids must be identified and their vascularization must be preserved [17]. The identification of parathyroids requires a mastery of their anatomical situation and their number. Thus the surgeon must take into account the notions of supernumerary parathyroids and parathyroid dysplasia which, although rare, have been described in the literature [19]. Topographically, the lower parathyroids have a slightly different situation from that of the upper parathyroids [19]. The latter seem to be more fixed, always located in a more posterior position compared to the lower parathyroids [19]. The lower parathyroids are more lateral, generally independent of the thyroid lobe, embedded in the cellulo-fatty tissue that surrounds the lower pole. But often they can be pressed against the external face of the lobe, of which it adheres intimately to the capsule (mural parathyroids). The vasculature of the parathyroids is comparable to a "cherry hanging from its stem". The lower parathyroids are supplied exclusively by the lower thyroid artery. The superior parathyroids are vascularized either by the posterior marginal anastomotic arch or by a branch of the inferior thyroid or by the superior thyroid artery [17, 19]. Ligation of these vessels in contact with the thyroid parenchyma preserves the vascularization of the parathyroids. The consequences are less dramatic in the event of lobo-isthmectomy [4, 17]. In our study, we noted an accidental devascularization of the parathyroids lower in three patients (15%) and infiltration of the upper parathyroids in 1 patient (5%) related to hemorrhagic constraints. Several factors explain the hemorrhagic risk of large goiters. These include the hypervascularization of the thyroid parenchyma, the more marked dilation of the peripheral vessels, the very close relationship with the jugulocarotidian axis and the overflow onto the aortic arch [17].

Tracheomalacia is one of the most common complications of plunging goiters, it is caused by the tracheal compression induced by the goiter [8, 17]. It is characterized by a weakness of the wall of the trachea related to a softening or destruction of the supporting cartilage which collapses on expiration leading to a reduction of at least 50% of the die. We did not note any case of tracheomalacia. The attitude towards lymph nodes has been widely discussed by the authors [20]. The lymph node procedure in our context consisted of a hollowing out of the bilateral central compartment associated with an obvious lateral homolateral to the affected lobe since our two patients had preoperative clinical lymphadenopathy. We were not able to perform a totalization by IRA-therapy since this therapy was not accessible in our context, which forced us to perform complementary radiotherapy in our patients. Postoperative follow-up depends on the histological type [20]. In our case, the anatomopathological examination concluded to a papillary carcinoma in one case and a medullary carcinoma in one.

5. Conclusion

The majority of submerged goiters can be extirpated purely cervically. However, in rare cases a sternotomy may be necessary. The dilation of the peripheral vessels, the hypervascularization of the thyroid tissue are factors aggravating the haemorrhagic risk. Dissection of the recurrent nerve should be done retrograde. Postoperative follow-up depends on the histological type. case. We proceeded to a dosage of thyroglobulin, TSH and calcemia which were normal. The control cervical ultrasound did not find a stump in the cases of cancer.

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