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Conventional thyroidectomy versus miniinvasive thyroidectomy

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Unintentional parathyroidectomy and postoperative hypocalcaemia. Conventional thyroidectomy versus miniinvasive thyroidectomy

BACKGROUND: *Hypocalcemia and unintentional parathyroidectomy would be associated as cause of post-thyroidectomy hypocalcemia.*
MATERIALS AND METHODS: *We analysed the cases treated with total thyroidectomy by two experienced endocrine surgeons from January 2010 to December 2011 at the Unit of General Surgery and Organ Transplantation of the University Hospital of Parma. These cases were divided in two groups: "Group A" included patients for whom a histological report was made that was negative for a parathyroid avulsion, and "Group B" included patients for whom an inadvertent avulsion of the intracapsular parathyroid glands had occurred.*
RESULTS: *In total, 538 patients were treated with a total thyroidectomy from January 2010 to December 2011. In 26 cases, the histological report highlighted the presence of an intracapsular parathyroid gland. The values of pre-operative calcaemia in group A and group B were 9.204 ± 0.2703 mg/dl versus 9.283 ± 0.401 mg/dl, respectively (p=0.32). The values of post-operative calcaemia were 8.039 ± 0.596 mg/dl for group A versus 7.569 ± 0.618 mg/dl for group B (p=0.0002) In Group A, 91/512 patients were treated with the minimally invasive video-assisted thyroidectomy (MIVAT) technique (17,7%), while 1/26 patients in group B was treated with* a MIVAT (3,8%).
DISCUSSION: *Unintentional parathyroidectomies can occur with experienced surgeons, but this complication is not related to a substantial difference in the incidence of hypocalcemia. MIVAT can helps the endocrine surgeon in the detection of the parathyroids glands, but when the parathyroid is intracapsular, is difficult to preserve it, during surgical dissection.*

KEY WORDS: MIVAT, Post-thyroidectomy hypocalcemia, Thyroidectomy, Unintentional parathyroidectomy

Introduction

Total thyroidectomy and near total thyroidectomy are the procedures most commonly used in the surgical treatment of thyroid disease. We define a total thyroidectomy as the complete removal of the thyroid gland. The adverse events associated with thyroid surgery are known to include hypocalcaemia. The incidence reported in the literature varies according to the experience of the surgical team with endocrine surgery [1] The causes of post-thyroidectomy hypocalcaemia are multifactorial and result in different clinical symptomatology. Several authors have considered the use of pre-, intra- and post-operative parathormone (PTH) levels and the plasma concentration of ionised calcium as predictive risk factors for hypocalcaemia [2-6].

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Currently, we are unable to predict the real risk factors for hypocalcaemia, and only female gender has been reported as a risk factor in the literature [7,8]
The factors related to a lower incidence of hypocalcaemia are the surgeon's correct knowledge of the following: parathyroid embryology, the anatomical side for the procedure, the vascularisation and the possibility that more than 4 parathyroid glands may be present and may be ectopic.
In this study, we observed the risk of hypocalcaemia using a different approach.
We compared the cases treated with a conventional total thyroidectomy and videoassisted total thyroidectomy where the postoperative histological examination was negative for an inadvertent parathyroidectomy and the cases where the histological examination was positive for an intracapsular parathyroidectomy.

Materials and Methods

We analysed the cases treated with a total thyroidectomy by two experienced endocrine surgeons from January 2010 to December 2011 at the Unit of General Surgery and Organ Transplantation of the University Hospital of Parma. For all of the patients, age, sex, the number of parathyroid glands identified intraoperatively by the endocrine surgeon, the pre- and post-operative values of serum calcium, and the occurrence of a definitive histological examination were recorded in a dedicated database. These cases were divided in two groups. Group A included the patients for whom a histological report was made that was negative for a parathyroid avulsion, while group B included the patients for whom an inadvertent avulsion of the intracapsular parathyroid glands had occurred. The cases were also classified about the open or videoassisted technique used.
We analysed the differences in variables between the two groups with the student t-test and chi-square test; the data with a $p<0.05$ were statistically significant.

Results

In total, 538 patients were treated with a total thyroidectomy from January 2010 to December 2011. In 26 cases, the histological report highlighted the presence of an intracapsular parathyroid gland. The mean age of the two groups was not statistically different (54.58 ± 15.57 years versus 55.10 ± 14.29 years, p=0.86).
The values of pre-operative calcaemia in group A and group B were 9.204 ± 0.2703 mg/dl versus 9.283+ ± 0.401 mg/dl, respectively (p=0.32).
The values of post-operative calcaemia were 8.039 ± 0.596 mg/dl for group A versus 7.569±0.618 mg/dl for group B (p=0.0002) (Table I).
We identified the descriptions provided by the endocrine surgeons in the surgical reports regarding the intra-operative identification of the parathyroid glands. In group A, the number of parathyroid glands identified was 2.69 ± 0.62, while in group B, the number of parathyroid glands identified was 2.52 ± 0.71 (p=0.21).
We also evaluated the relationship between the mean values of pre-operative calcaemia and postoperative calcaemia for each group; the pre-operative value of calcaemia in group A was 9.344±0.14 mg/dl versus the post-operative value of 8.007±0.145 mg/dl (p<0.0001). In group B, the value of pre-operative calcium was 9.204 ± 0.273 mg/dl versus the post-operative value of 7.569 ± 0.618 mg/dl (p<0.0001).
The definitive histological reports identified follicular adenoma in 2 cases, papillary carcinoma in 9 cases, goitre in 8 cases, toxic goitre in 4 cases, Basedow disease in 2 cases and in Hurthle cell carcinoma in 1 case (Table II). The parathyroid side for the procedure was the superior right side in 8 cases, the superior left side in 8 cases, the inferior right side in 4 cases and the inferior left side in 6 cases.
A mean follow up of 12 months did not identify definitive hypocalcaemia.
In Group A, 91/512 patients were treated with the minimally invasive video-assisted thyroidectomy (MIVAT) technique (17.7%), while 1/26 patients in group B was treated with a MIVAT (3.8%).

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TABLE I - *Analysi of cases on sex, age, pre and postoperative calcemia, number of parathyroid identified*

	Sex	Mean age (years)	Preoperative calcemia (mg/dL)	Postoperative calcemia (mg/dL)	Number of parathyroid glands
Group A (512 pts)	405 F 107 M	54,58 ± 15,57	9,204 ± 0.2703	8.039 ± 0.596	2.69 ± 0.62
Group B (26 pts)		55,10 ± 14,29	9.283 ± 0.401	7.569 ± 0.618	2.52 ± 0.71
p	F:M=4:1	0.86	0.320	0.0002	0.21

TABLE II - *Hystological type (26 cases)*

Follicular adenoma	2
Papillary carcinoma	9
Hurthle carcinoma	1
Goiter	8
Toxic goiter	4
Basedow	2

The value of pre-operative calcaemia in group A treated with MIVAT and assessed by CT was 9.265±0.387 mg/d versus the pre-operative calcaemia value of 9.208±0.359 mg/dl for group B (p=0.45). The post-operative calcaemia values for the two subgroups were 7.967 ± 0.542 mg/dl for group A vs. 8.081 ± 0.524 mg/dl for group B (p=0.2954).

Discussion

An inadvertent parathyroidectomy as a complication of a thyroidectomy has been shown to occur at a rate of 3.7 – 21.6% [9].

The causes are multifactorial, but the intrathyroidal location of the parathyroid glands has been reported in 13,6% to 50% of the cases of inadvertent parathyroidectomy [10,11]. Endocrine surgeons know the importance of an accurate understanding of the location of the parathyroid glands and the correct surgical techniques. Other potential risk factors for hypocalcaemia are reoperative thyroid surgery, intraoperative bleeding, and the low volume of patients treated/year [12]. The endocrine surgeons know that accidental resection and/or devascularisation of parathyroid glands is relatively common during a secondary lymphadenectomy of the central compartment associated with a laterocervical dissection [12]. Post thyroidectomy hypocalcaemia is a complication that might represent a cost in the management of patients. In our previous study on post-thyroidectomy hypocalcemia [8], we determined that there were no differences in hypocalcemia according to the type of surgical procedure performed (mini-invasive or traditional procedure). In fact, the only proven risk factor was female sex.

In this case series, we have shown that the pre-operative calcaemia level was not statistically significant different between the two groups. Instread, the pre-operative calcaemia levels were statistically different from the post-operative levels in both groups.

The values of post-operative calcium were statistically significant different in the two groups, with a lower value in the Group B (presence of parathyroid parenchima at definitive hystological report).

In our experience, in according with the literature, permanent hypocalcaemia, defined as persistent hypocalcemia requiring calcium and vitamin D supplementation 6 months after surgery, is rare.

In our previous report, we analysed the number of parathyroid glands identified by endocrine surgeons during the intervention, and the number was not related to hypocalcaemic crisis [8].

In the current series, none of the patients reported hypocalcaemic clinical symptomatology at the 12 month follow up appointment.

The risk of transient hypocalcemia post-thyroidectomy is high [13]; our experience suggests that an unintentional parathyroidectomy does not affect serum calcium levels [14,15]. Some authors have identified a relationship between postoperative hypoparathyrodism and papillary carcinoma in a series of 442 treated patients, and this risk should be explored further in future studies [16].

In our experience, we have shown that patients treated with the MIVAT technique represent approximately 20% of the patients treated, and the incidence of postoperative hypocalcemia is reported to be only 3.8%. We think that the volume of the gland and thyroiditis are related to this rate; additionally, image magnification using a camera could be helpful for the endocrine surgeon to correctly identify the parathyroid glands.

In conclusion, inadvertent parathyroidectomies can occur with experienced surgeons, but this complication is not related to a substantial difference in the incidence of hypocalcemia. Minimally invasive video-assisted thyroidectomy with the advantage of the image magnification obtained by the camera can help the endocrine surgeon in the detection of the parathyroids glands. In other cases, when the parathyroid gland is intracapsular, could be difficult to preserve it, during surgical dissection.

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Commento e Commentary

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È doveroso considerare che in caso di tiroidectomia totale la casuale presenza di tessuto paratiroideo ectopico all'interno della capsula tiroidea comporta la sua inevitabile asportazione insieme al parenchima tiroideo a meno che un colorito giallastro subito sotto la metta sull'avviso il chirurgo sulla presenza di probabile tessuto paratiroideo ectopico, In tal caso il chirurgo potrebbe isolare cautamente questo tessuto dal parenchma tiroideo prima di completare la tiroidectomia, purchè sia possibile preservarne la vascolarizzazione. Come alternativa, tale tessuto ectopico può essere prelevato ed impiantato estemporaneamente all'interno di un muscolo. Per fortuna la presenza ectopica di tessuto paratiroideo all'interno di quello tiroideo non è così frequente, per altro verso la frequente esistenza di paratiroidi ectopiche nell'ambito del mediastino contribuisce comunque all'equilibrio postoperatorio della calcemia, dopo un possibile breve periodo di ipocalcemia spontaneamente reversibile.
Il consiglio da dare a tutti i chirurghi per evitare l'asportazione inavvertita ed inevitabile delle paratiroidi ortotopiche nel corso di una tiroidectomia totale ha due punti: scivolare con la dissezione a stretto contatto con la capsula tiroidea e di non effettuare l'emostasi a distanza dalla tiroide inferiore, specialmente evitando di allacciare l'arteria tiroidea inferiore a distanza dalla capsula, preservando così la paratiroide inferiore con la sua vascolarizzazione, distaccandola ben vascolarizzata dalla capsula tiroidea.
Questi consigli sono validi sia in chirurgia tradizionale che con la MIVA in caso di tiroidectomia totale.

* * *

It is of the utmost importance to consider that in case of a total thyroidectomy the incidental presence of ectopic intracapsular parathyroid tissue bears to its unavoidable removal togheter with the thyroid parenchyma in course of either of traditional or MIVAT surgery, unless an yellowish color beneath the capsule alerts the surgeon of the subcapsular ectopic presence of parathyroid tissue. In this case the surgeon could carefully isolate it from the thyroid parenchyma before completing the thyroidectomy provided its vascularization appears as preserved .As an alternative this ectopic tissue could be implanted inside a muscle.
By chance the presence of intrathyroidal parathyroid tissue is not so frequent, and under other consideration the frequent presence of ectopic mediastinal parathyroid glands preserves the post-operatory calcium balance, after a possible short period of postoperative and spontaneous riverside hypocalcemia. The advise to give to all surgeons to avoid an inadverted and avoidable removal of normal and orthotopic parathyroid glands in course of a total thyroidectomy is twofold: to slide accurately on the very surface of the thyroid capsule during the dissection and not to perform lower hemostasis at distance from the gland , as for example tying of an inferior thyroid artery far from the capsule, so preserving the visible ortothopic parathyroid inferior gland with its vascularization detaching it viable and with its vascuarization from the thyroid capsule.
And this advices are valid in traditional as in the MIVAT procedure for thyroidectomy