FOCUSED PARATHYROIDECTOMY

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ABSTRACT

This study included selected 30 patients with primary hyperparathyroidism (PHPT) due to solitary adenoma after exclusion criteria. All our patients were submitted preoperatively to: estimation of serum calcium level, serum parathormone (PTH) level, bone survey, neck ultrasonography and technetium 99 sestamibi (Tc99 MIBI) scan. After adequate localization of the parathyroid adenoma, all our patients were treated surgically by excision of the previously adequately localized parathyroid adenoma through a unilateral neck exploration.

Conclusion : The unilateral neck exploration (focused technique) for treatment of PHPT due to solitary adenoma can be considered as a good method of treatment of such condition regarding the less surgical morbidity, favourable cosmesis, patient satisfaction, shorter operating time and earlier discharge.

INTRODUCTION

Regarding PHPT, there is now fairly general agreement that, with few exceptions, surgical operation on the neck with the aim of removing all hyperfunctioning parathyroid tissue represents the treatment of choice for patients in whom the diagnosis is made (1). The traditional, conventional operation for hyperparathyroidism (HPT) involves a cervical approach through a standard "collar" incision placed sympathetically in the lower neck, routine exploration of both sides of the neck with the intention of identifying and exposing all four parathyroid glands, and resection of all enlarged glands. If all four parathyroids are found to be enlarged, most endocrine surgeons will remove three or three

and half glands, leaving a remnant equivalent in size to a normal parathyroid [2].

As increasing numbers of patients with HPT have undergone cervical exploration, it has become abundantly clear that in the overwhelming majority, the underlying pathology is a solitary adenoma (80% - 90%) [3]. Consequently, the option of a unilateral operation with removal of the solitary tumor, in this large proportion of patients has been increasingly considered [4]. It is important to underline the fact that the term "unilateral neck exploration" describes an operation for HPT in which one side of the neck only is exposed and explored. If the surgical approach is via a collar incision, following exploration of the chosen side, the procedure is terminated and the strap muscles on the contralateral side of the neck are neither disturbed nor dissected [5]. The strategy of unilateral cervical exploration for parathyroid adenoma was first suggested by Roth and Colleagues [4] and subsequently developed by Tibblin and associates [5]. Working and reporting at a time before current parathyroid localization procedures had become available, both of these groups practiced blind exploration of the neck, with termination of the operation if a single tumor was identified on the side initially explored [6]. Gradually, as confidence in preoperative localization of parathyroid adenomas using ultrasonography and Tc99 MIBI scanning, an increasing number of endocrine surgeons have become persuaded of legitimacy of unilateral neck exploration for HPT. The development, availability, and increasing sophistication of a "quick" PTH assay that, in a high proportion of patients permits an intraoperative assessment of whether or not all hyperfunctioning parathyroid tissue has been removed, has bolstered the confidence of some of those performing unilateral parathyroid exploration [7]. Further, as considerations relating to the cosmetic aspects of neck surgery have become to the fore, and as various minimally invasive parathyroid procedures have, within the past few years, emerged, more and more surgeons are turning to and practicing a targeted unilateral neck exploration in a significant proportion of their patients with HPT [8].

AIM OF THE WORK

Surgical evaluation of the focused parathyroidectomy through unilateral neck exploration as a method of

treatment of PHPT due to solitary adenoma.

PATIETS AND METHODS

This study included 30 selected patients. Their ages ranged from 15 – 45 years with mean age 25 years. They were 18 females and 12 males with PHPT resulting from solitary adenoma. The study was done in Mansoura Endocrine Surgery Unit during the period from (June 2003 to May 2004 inclusive). Our patients attended to the endocrine outpatient clinic or referred from orthopedic department (delayed bone union or pathological fracture) and urology clinic (multiple, recurrent or bilateral urinary stones).

All our patients were submitted to :

1) Careful history taking: special stress on history of pathological fracture, delayed bone union, multiple, bilateral or recurrent urinary stones (stone forming patient), neck swelling, abdominal pain and cramps, easy muscular fatigability, psychic troubles or silent hypercalcaemia incidentally discovered during routine investigations.
2) Clinical examination: that included general medical examination and then local neck examination trying to find a parathyroid adenoma (very rarely palpated), enlarged lymph nodes or thyroid swelling.
3) Investigations: that included:

a- Laboratory investigations:

- Complete blood picture.
- Serum creatinine.
- Fasting & 2 hours post prandial blood sugar levels.
- Liver function tests.
- Serum calcium (preoperatively and 2 weeks postoperatively).
- Serum PTH (preoperatively, intraoperatively 15 minutes after removal of the adenoma and 2 weeks postoperatively).

b- Radiological investigations:

- Bone survey.
- Neck ultrasonography.
- Tc99 MIBI scan after injection of 25 microcuri of the radioactive material then photographs were taken; (early phase 15 minutes after injection of the radioactive material and late phase 3 hours after injection of the radioactive material).

Exclusion criteria :

We should stress on that, unilateral neck exploration is not an appropriate procedure for treatment of HPT in certain circumstances:

1) When the isotope scan fails to

identify the site of the adenoma or demonstrates multiple foci of activity.

2) When two enlarged parathyroids are located on the first side of neck explored.
3) When no abnormal gland is identified on exploration of the initial side.
4) When familial HPT or multiple endocrine neoplasia is suspected. In all of the situations, the patient should undergo a standard bilateral cervical exploration.

Operative procedure :

1- General anaesthesia with endotracheal tube.
2- Patient lies in thyroidectomy position (hyperextended neck with a pillow under shoulders).
3- A short (2-3 cm) incision is placed on the relevant side of the neck.
4- Anterior border of sternomastoid muscle is retracted laterally and strap muscles are retracted medially.
5- Visualization of the lateral border of the thyroid gland.
6- Direct access to the parathyroid bearing areas.
7- Adenoma is then exposed and excised.
8- Intraoperative assay of PTH (15 minutes after removal of the adenoma).
9- Closure of the wound in 3 layers (muscles, platysma, skin) without drain after adequate haemostasis.
10- Postoperative analgesia and discharge within 6 – 8 hours after surgery.

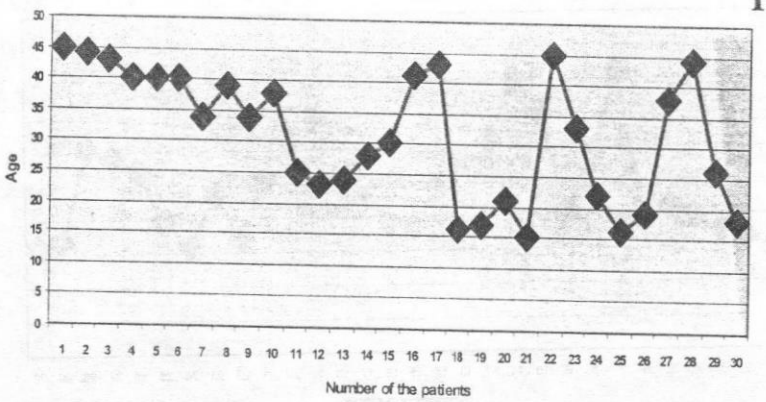
Table (1): Operative time.

	Patients	Test of significance
Mean	47.5	P = 0.004
SD	13.25	
Range (minutes)	13 – 50	

Table (2): Complications.

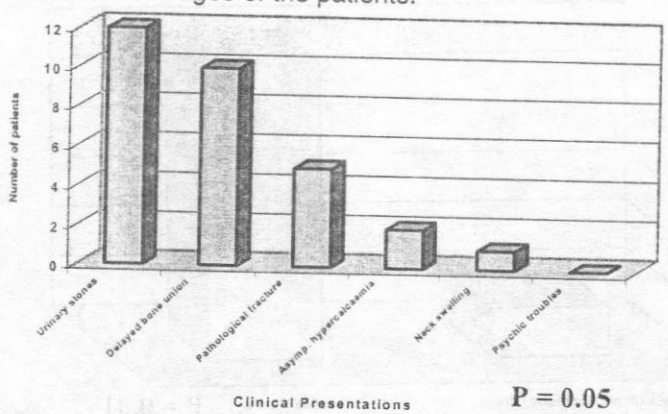
Complication	Number of patients	Percent
Wound infection	-	0%
Postoperative haematoma	1	3.33%
Hypocalcaemia	-	0%
Recurrent hypercalcaemia	2	6.66%
Recurrent laryngeal nerve injury (temporary)	1	3.33%

P = 0.001



P = 0.001

Fig (1) : Variation of the ages of the patients.



P = 0.05

Fig (2) : Clinical presentations of primary hyperparathyroidism.

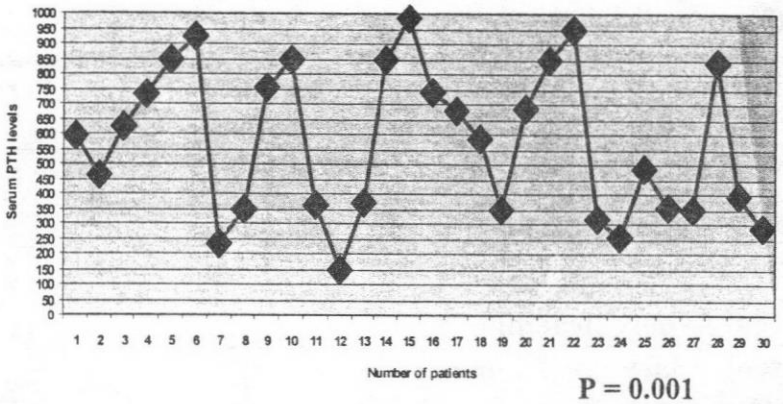


Fig (3) : Preoperative PTH level assay .

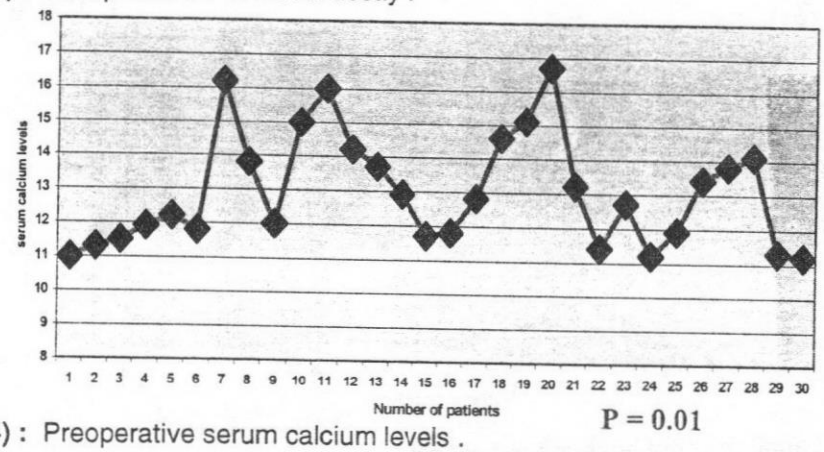


Fig (4) : Preoperative serum calcium levels .

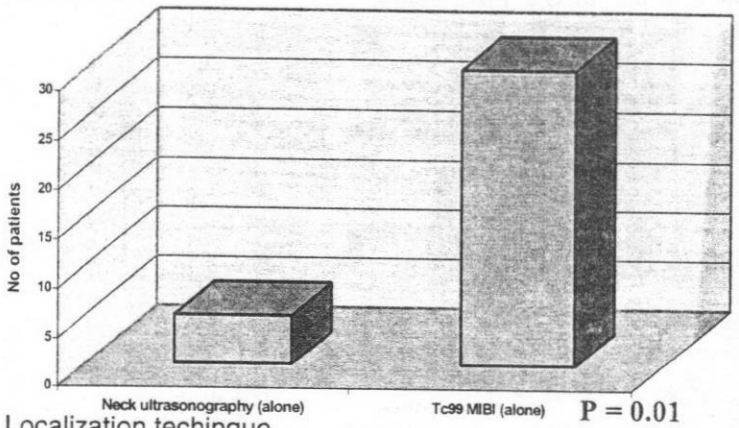
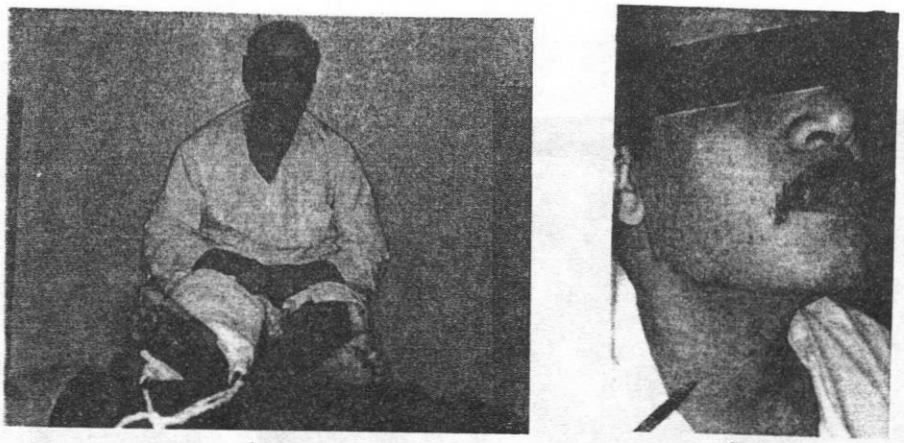


Fig (5) : Localization techinque .



(A) (B)

Fig (6) : (A) PHPT presented by delayed bone union (fracture femur) note : Thomas splint.
(B) The same patient with pointing to the side of the adenoma localized by scan .

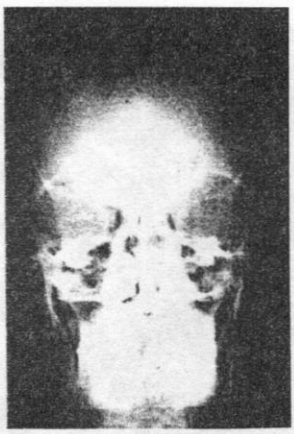


Fig (7) : Plain x-ray of skull showing generalized bone rarifaction and bone cysts with characteristic salt and pepper appearance .

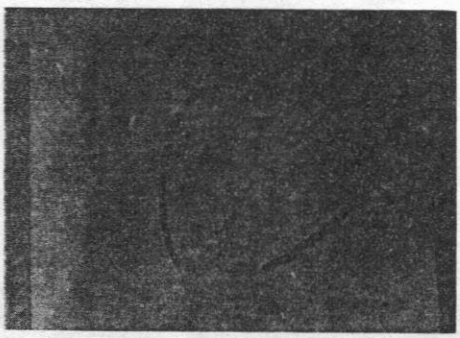


Fig (8) : Plain x-ray showing multiple renal stones and nephrocalcinosis.

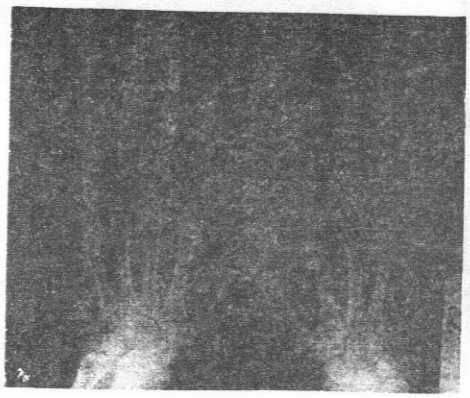


Fig (9) : Plain x-ray both hands showing small erosions along the medial aspect of middle phalanx of the 2nd and 3rd fingers.

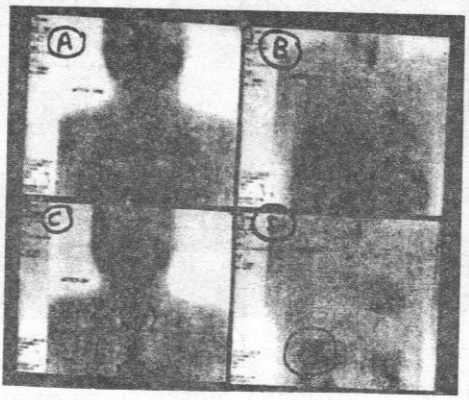
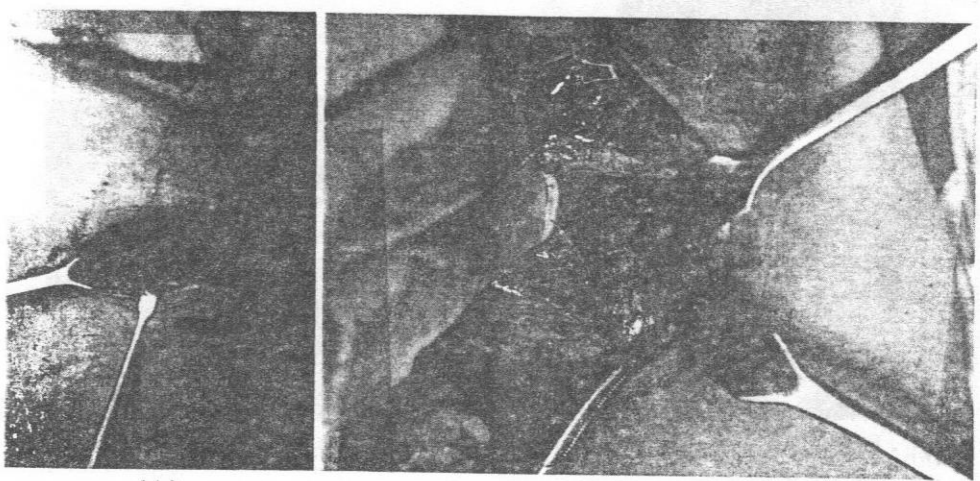


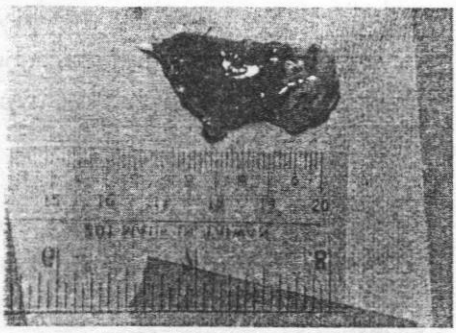
Fig (10) : A B, C, D Tc^{99} MIBI scan showing a single parathyroid adenoma (lower left).
Note : Fig 10D photograph taken after 3 hours, lateral view .



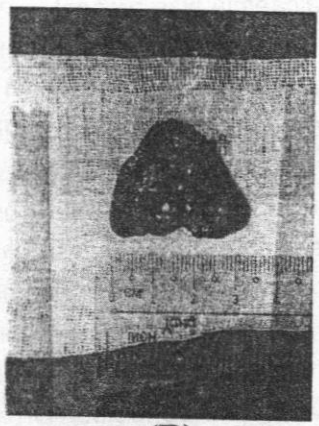
(A) (B)

Fig (11) : (A) Lateral neck exploration over the adeoma (focused).
(B) Excised parathyroid adenoma.

Fig (12) : The incision of lateral neck exploration after healing and removal of stitches.



(A)



(B)

Fig (13) : Resected parathyroid adenoma.
(A) Gross picture.
(B) Cut section.

DISCUSSION

Surgery is currently the only available cure for PHPT. Traditionally the indication for parathyroidectomy in PHPT has been symptomatic hypercalcaemia in the presence of an inappropriately raised parathormone (PTH) level. Parathyroidectomy improves the fatigue as well as the bone, abdominal, urological and mental symptoms (9). In our study we did parathyroidectomy for the same indications mentioned above. Urological symptoms in the form of multiple, bilateral or recurrent urinary stones were present in 12 patients. Delayed bone union was present in 10 patients. Pathological fracture was present in 5 patients. Asymptomatic hypercalcaemia was present in 2 patients. Palpable neck swelling (adenoma) was present in only 1 patient and no psychological patients were present. Schell and Dudley (10) described that 25 years follow up of patients with untreated hypercalcaemia demonstrates an excessive number of premature cardiovascular deaths compared with age matched normocalcaemic controls. On this base we considered, in our study, that asymptomatic hypercalcaemia due to parathyroid adenoma is an important indication for parathyroidectomy.

Support for the concept of unilateral cervical exploration for HPT in appropriate circumstances had always existed amongst a small number of endocrine surgeons but after subsequent experience that confirmed the ability of sestamibi-technetium scanning to accurately localize a very high proportion of parathyroid tumors even if weighing less than 500 mg, the technique becomes more and more popular among endocrine surgeons (11). The localization technique using Tc99 MIBI could successfully visualize all solitary adenomas in our study (30 patients). Nussbaum et al. (11) reported on a group of eight patients with HPT, on each of whom they had successfully performed a unilateral operations for solitary adenoma. They had used cervical ultrasonography preoperatively to localize the tumors, and had innovatively confirmed removal of all hyperfunctioning parathyroid tissue by measuring the circulating levels of parathyroid hormone intraoperatively using a rapid PTH assay. Gradually as the confidence in preoperative localization of parathyroid adenoma using radionuclide scanning and ultrasonography has grown, and as the results of these techniques have improved, an increasing number of en-

docrine surgeons have become persuaded of the legitimacy of unilateral neck exploration. In our study, neck ultrasound failed to localize adenoma in (25 patients) and succeeded in only (5 patients). This may be due to that it is an operator dependent instrument. Regarding PTH level it was elevated preoperatively in all our patients (N = 7 – 53 pc/ml). It reached even up to 20 folds in some patients. Intraoperative PTH assay was done in all our patients to make sure that the functioning adenoma had been removed. It was done 10 – 15 min after removal of the adenoma because PTH has a half-life of several minutes and success in noted by a fall of PTH level more than 50% of its predissection value. Allendorf (12) stated that the excellent results achieved by a unilateral neck exploration bear out the often quoted truism that the most important preoperative localization procedure required in parathyroid surgery is the localization of an able parathyroid surgeon and indeed, in the past, preoperative localization of the parathyroid was used only in cases of re-exploration following an unsuccessful parathyroidectomy.

The mini-incision parathyroidectomy is the current method of choice of the majority of the numbers of international association of endocrine surgeons. This procedure is most commonly referred to as "minimally invasive parathyroidectomy" (MIP) but focused neck exploration seems a more coherent terminology (13). The point at which the procedure becomes a minimal-access operation presumably is best defined by the length of incision, however current techniques for conventional parathyroidectomy have evolved to use shorter incisions – 4.1cm for bilateral & 3.2 cm for unilateral explorations, and these rather than the traditional "Kocher" incision of 8cm to 10cm. Minimally invasive parathyroidectomy should be performed through an incision not more than 2.5cm. In our study, the length of incision did not exceed 3.5cm even after extension of the wound. The focused parathyroidectomy was associated with little complications no reported cases of wound infection. One patient developed haematoma and required further evacuation and drainage. No patients developed hypocalcaemia. Two patients developed recurrent hypercalcaemia and proved later on to have other multiple small adenomas not adequately localized by scanning preoperatively and re explored again through classical kocher

collar incision. One patient developed unilateral temporary recurrent laryngeal nerve palsy at the explored neck side and improved completely after 2 weeks. The unilateral neck exploration have the advantages of favourable cosmesis and patient satisfaction, shorter operating time and earlier discharge. Sidhu et al. (14) described that a solitary parathyroid adenoma was retrived from 182 of the 184 patients who had a focused unilateral procedure performed, with parathyroid hyperplasia and parathyroid carcinoma being diagnosed in the other 2 individuals. One patient died from pneumonia 14 days after cervical exploration having been discharged from hospital clinically well and normocalcemic. One individual (0.5%) required calcium supplements for more than 12 months for symptomatic hypocalcaemia and 2 patients (1%) had unintentional permanent vocal cord paralysis following operation.

Conclusion :

- There can no longer be any bebate over legitimacy of focused, unilateral neck exploration as an appropriate option for the patient undergoing operation for HPT.
- Fundamental to successful practice of this technique is accurate preoperative localization of parathyroid adenoma.
- This technique is not offered as an "easy" surgical option and needs a great surgical experience.
- This technique has the advantages of: favorable cosmesis, patient satisfaction, shorter operating time, earlier discharge and consequently earlier return to work.

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الإستئصال المحدد للغدة الجار درقية

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أجرى هذا البحث على ثلاثين من المرضى المصابين بازدياد فى وظائف الغدة الجار درقية. من المعروف أن عدد الغدد الجار درقية فى جسم الانسان أربع غدد ولهذا لابد أن نعلم أن هذا البحث يقتصر على المرضى المصابين بتضخم أو نشاط زائد فى غدة واحدة من الغدد الجار درقية. تم علاج هؤلاء المرضى بوحدة جراحة الغدد الصماء بكلية طب المنصورة. تم تشخيص حالات هؤلاء المرضى بواسطة أخذ التاريخ المرضى وغالباً مايتم تحويلهم من قسم العظام نتيجة كسور مرضية أو تأخر فى التئام العظام، أو يحولون من قسم المسالك البولية لوجود حصوات متعددة أو متكررة بالجهاز البولى. ونادرا ماكان هؤلاء المرضى يعانون من تضخم بالرقبة.

تم عمل التحاليل المعملية وأهمها قياس نسبة الكالسيوم بالدم وكذلك قياس نسبة هورمون الغدة الجار درقية (الباراثورمون) وكلاهما كان مرتفعا قبل العملية بنسب متفاوته وإنخفض بشكل ملحوظ بعد الجراحة.

يتم تحديد مكان الغدة المتضخمة أو النشطة بالرقبة باستخدام الموجات فوق الصوتية والنظائر المشعة.

بعد تحديد مكان الغدة المتضخمة يتم الفتح فى حدود (٣سم يمكن زيادته ٢/١ سم) فى الجزء الخارجى من الرقبة الذى تقع تحته مباشرة الغدة المتضخمة التى يتم استئصالها جراحياً .

وتعتبر هذه الطريقة جيدة نسبياً حيث يكون الجرح صغير عن الجرح القديم (كوخر) والذى كان يبلغ طوله ٨-١٠ سم والشكل الجمالى أفضل ويمكن خروج المريض من المستشفى بعد عدة ساعات من الجراحة.

ولكن هذه الطريقة ليست سهلة وتحتاج لخبرة جراحية كبيرة فى هذه المنطقة من الجسم مع وجوب تحديد مكان الغدة النشطة أو المتضخمة تحديدا دقيقا قبل إجراء الجراحة .