ULTRASOUND IN POST SURGICAL THYROID CANCER
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SUMMARY

A retrospective study was conducted by performing ultrasound (US) scans in patients that had undergone surgery due to thyroid cancer between the years 1995 and 2010.

The usefulness of US scans in postoperative follow-up of thyroid cancer is analyzed. They are used to detect remnant thyroid tissue and to assess if it is normal or pathological according to its ultrasonic image and degree of vascularization. Also it is used to detect possible recurrences and measure response to treatment.

US scans are of the utmost importance in the postoperative study of the neck.

KEY WORD: US, thyroid cancer, colour Doppler, remnant, recurrence

INTRODUCTION

The use of US scans to study the thyroid gland is a reliable method for detection of thyroid cancer and for postoperative surveillance. It is the best way to study the neck after surgery.

Thyroid cancer is the most frequent glandular neoplasm. However, it is only 1% of all human tumours. (1) As much as 90 % of thyroid tumours are differentiated thyroid cancers in papillar and follicular forms. The remaining 10 % are undifferentiated like the anaplastic, medullar lymphoma, sarcoma, carcinoma and metastases. (1)

According to histologic findings, survival rate after 10 years is 99% for differentiated thyroid cancer, 75% for medullar and less than 5% for anaplastic. (1,2) However, more than 20% of differentiated cancers produce regional recurrences and 8% of those patients die.(2)

The American Thyroid Association suggests the use of neck US scans in postoperative patients with thyroid cancer. If a recurrence is found, a fine needle aspiration (FNA) should then be performed. (2)

The US-guided FNA is the ‘gold standard’ for diagnosis. It has a 60-90% sensitivity, 100% specificity, 100% positive predictive value and 80% negative predictive value and 85% accuracy.

With the US-guided FNA cancer can be detected in lesions 3-5 mm in size (1,3,4)

For a correct and beneficial use of the echographic method, the patient’s surgical history has to be provided. This should include preoperative diagnosis, primary tumour’s histology, if diagnosis was reached through FNA, surgical protocol followed, surgical procedure used, lymph nodes resection, number of surgical procedures performed, and confirmation by clinical pathology.

The echographic study has to include the whole thyroid compartment if it was a total thyroidectomy or the remaining gland when it was a partial resection as well as an exploration of the territories of all neck lymph nodes. (5)

During the first year after the surgery US scans are performed every three months, in the second year every six months and then once a year. This plan depends on blood test results (thyroid function test) or TSH level after stimulated Thyroglobulin (Tg) which may
indicate persistence of the disease, recurrence or affected lymph nodes but cannot be detected in 30-75% of patients after a total thyroidectomy. (5)

For a patient to be clinically discharged or considered free of detectable disease 8-12 months after surgery, undetectable levels of stimulated Tg in serum and a normal US scan are required. Palpable lymph nodes or tumours in the thyroid compartment indicating tumoral activity mean changes should be introduced in the treatment protocol and the right moment for performing the US scan should then be decided.

The previous US scans should be available for comparison and to estimate evolution.

Surgical removal may be total or partial.

When partial, morphology of the remnant, its ultrasonic structure and detection of nodules as well as their features and vascularization have to be studied as before the surgery.

This paper aims to convey the results of 15 years studying the follow-up of patients after thyroid cancer surgery, underlining the use of US scans and FNA for early diagnosis of recurrences.

The long term evolution after Iodine 131 treatment should also be known since its action goes on for a long time, changing the image of the remnant in the succeeding scans to the point of undetection due to diminished size and vascularization. The Iodine 131 ablation can be performed to complement surgical removal of an aggressive thyroid cancer or when high serum levels of stimulated Tg are found, but it has to be avoided when US detected recurrences are absent or serum Tg levels are undetectable (5).
Fig. 4. Metastatic node: Cross section, power angio. Rounded node with peripheral vascularization. (It was proved to be a metastatic node of a papillary carcinoma).

USEFULNESS OF US SCANS AFTER THYROID CANCER SURGERY

Thyroid cancer postoperational scans performed both at a private clinic and at the US section of the Imaging Dept. of the ‘Dr. Manuel Quintela’ University Hospital between 1995 and 2010 were reviewed.

Correlation between echographic findings, surgical findings, clinical pathology findings and patients’ clinical evolution was made

ECHOGRAPHIC FINDINGS

VASCULARIZATION, NODULES
A normal remnant may be uni- or bilateral and its echostucture and vascularization have to be those of the normal thyroid tissue. (fig. 1)
The scan report has to include form, size and vascularization of the remnant in order to allow comparison with succeeding scans.

Alterations in the echostructure include nodular images, calcifications, fibre-like dense tracts or diffuse heterogeneous areas without nodule detection. (fig.2).

A thorough study of nodules -when present- is important to assess a possible recurrence. Colour Doppler and 2D images are analyzed to determine if they are similar to those of the original tumour.

Fig. 5. Supraclavicular metastatic node: a) cross section in B mode showing solid and Cystic node in the supraclavicular fossa, secondary to papillary thyroid cancer (confirmed by FNA) b) diagram from Cejas, C. ‘Adenopatías, diferenciación entre benignas y malignas’, (8), showing the angioarchitecture of the nodes: benign on the left side and malignant on the right side.
A detailed description of the nodules should include their number, location, echostucture, shape, borders, size, halo, calcifications and vascularization. (6,7,8,9, 10)

**Fig. 6. Benign node:** Longitudinal section power angio, a node with typical vascular hilum can be seen.

Vascularization of the remnant should be scanty like in the normal thyroid tissue. Therefore, when nodules or calcifications are found, an increase in vascularization should not be present (10, 11) Fig. 3

**Fig. 7. Right-side remnant suggestive of malignancy** Longitudinal section with power angio. Abundant vascularization suggestive of malignancy. FNA biopsy proved it to be secondary to a follicular cancer.

**LYMPH NODES**
Identification of lymph nodes and description of their features is of the utmost importance. Their features and degree of vascularization may suggest whether they are benign or malignant. (12)

A node due to an inflammation has an echographic image different to that of a node secondary to a tumour. Also, surgery produces anatomical distortions that make nodes appear in atypical areas (11,12)

**Malignant nodes** are round in shape, with heterogeneous echostructure and similar features to those of the primary tumour: microcalcifications, cystic areas, or strange with an odd appearance hypoechoic areas. Vascularization is peripheral with aberrant thick vessels, and vessels absent or displaced. Figs 4,5. Diagram 1 (9,12) (authorized by the author)

**Fig. 8. Metastatic node:** Longitudinal section, power angio. Solid and cystic node with increased vascularization in the solid area. FNA biopsy proved it to be secondary to a papillary cancer.
Benign nodes (inflammatory) are oval, fusiform with a roundness rate of more than 1 (roundness rate: quotient obtained after division of both diameters of the node). Its echostructure is homogeneous and vascularization shows a hilum with peripheral branches. Fig. 6 (12)

US findings suggestive of a malignant recurrence (5,10,).
- increased size when compared to previous examinations.
- new nodules
- increased total or partial vascularization, increased vascularization of nodules, increased inner vascularization, thick, tortuous vessels suggestive of malignancy Fig.7.
- microlcalfications
- atypical regional lymph nodes Fig.8. When findings are suggestive of malignancy, a FNA is performed to reach diagnosis Fig.9.

Fig. 9. Pathological remnant Solid and cystic lesion with high vascularization. Scan made for planning of the FNA.

When the surgical removal of the thyroid gland is total, knowledge of the normal anatomy of the thyroid compartment in the neck is important. A hyperechoic image due to fibrous tissue with no vascularization can be seen at the surgical site but should not be confused with remnant thyroid tissue. Fig. 10

Hyperechoic scar tissue fibres can also be found, many times with calcifications as well as hyperechoic images due to sutures. In all cases the most important feature is the lack of vascularization. Fig. 11

Fig.10. Hyperechoic image in the thyroid compartment is fibrous tissue and not remnant thyroid tissue.

COMMENTS

Due to new findings, changes in treatment plans took place in many cases, usually after a recurrence was confirmed by FNA. Patients were then given new options in surgery, radiotherapy or radioisotopic therapy, improving the survival rate. A correct treatment of thyroid cancer has good chances of a high survival rate. Many of the patients included in this review have had normal checkups for more than 10 years. To have a reliable non-invasive method for the follow-up of these patients is extremely useful for the attending physicians
CONCLUSIONS

After a 15 year period of data collection we consider US to be the method of choice in postoperative follow-up of thyroid cancer due to the excellent anatomical information it provides. Also, when findings are suggestive of malignancy, an US-guided FNA may be scheduled to determine if there is a recurrence. It is a valuable tool for clinicians that allows them to introduce changes in treatment.

Some of these patients had single or multiple recurrences with good evolution after undergoing a new treatment. Only few patients in this group died due to thyroid tumor.

REFERENCES

2- Soo YeonHahn, Jung Hee Shin, Boo-Kyung Han, Eun Young Ko, Seok

Seon Kang, Jae Hoon Chung, Jug Han Kim, Young Lyun Oh and Young Ik Son Predictive factors related to the recurrence at US-guided fine needle aspiration in postoperative patients with differentiated thyroid cancer. Clinical Endocrinology (2011) 74, 270-275.


5- C Nascimento, I Borget, A Al Ghuzlan , D Ddeandreis, L Chami,J P Travagli, D Harti, J Lombroso, C Chouget, L Lacroix,E Baudin, M Schlumberger and S Leboulleux Persistent disease and recurrence in differentiated thyroid cancer patients with undetectable postoperative stimulated thyroglobulin level Endocrine - Related Cancer (2011) 18 R29-R40


7- Gretchen A.W.Gooding, MD.
Sonography of the thyroid and parathyroid RC. RCNA 1993, 31:967.


