Image Quiz for Surgeons

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Peroperative Detection with a Gamma Probe of Pelvic Metastasis after Differentiated Thyroid Carcinoma in Female Patients: About Two Cases and Management Reflections

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Rezumat

Detecția preoperatorie cu sondă gamma a metastazelor pelvine după carcinom tiroidian diferențiat la pacienții de sex feminin: despre două cazuri și reflecții asupra managementului

Introducere: Metastazele cancerului tiroidian diferențiat sunt excepțional localizate în țesturile moi din cavitatea pelvină. La pacienții asimptomatici de sex feminin, diagnosticul este complicat de rezultatele fals positive ale scintigrafiei datorate retenției de iod în secrețiile urinare și fecale precum şi fixării iodului în țesuturile tiroidiene ectopice, fenomene ce interferă cu fixarea la nivelul metastazelor unor cancere tiroidiene diferențiate.
Metodă: Prezentăm două cazuri de metastazectomie ghidate prin gamma detecție intraoperatorie și confirmate de examenul histopatologic extemporaneu. La pacienții de sex feminin, din cauza imaginilor scintigrafice fals positive, metastazele pelvice sunt dificil de identificat. Pe baza experienței noastre insistăm asupra mijloacelor de a identifica metastazele reale fără expresie clinică. În acest scop am utilizat preoperator scintigrafia cuplată cu CT (131 Iodine SPECT/CT whole body scan) şi o sondă de gama detecție intraoperator.
Concluzii: Localizarea preoperatorie a metastazelor pelvice fără expresie clinică necesită o imagistică tridimensională precisă iar tratamentul chirurgical trebuie ghidat intraoperator de un detector gamma şi confirmat prin examen histopatologic extemporaneu.

Cuvinte cheie: metastaze pelvice, carcinom tiroidian, ovar

Abstract
Background: Distant metastases of differentiated thyroid cancers are exceptionally localized in the soft tissues and the pelvic cavity. This last event complicates diagnosis, especially in female patients because of false positive nuclear imaging and unrelated iodine uptakes. False positive due to body secretions, urinary and fecal iodine retention and iodine uptake by non-thyroid tissues or ectopic thyroid tissue and bone metastasis of differentiated thyroid carcinoma.
Methods: We present two cases of metastasectomy, guided by a peroperative gamma probe and intraoperative frozen sections of the specimens. In females patients because of potentially false positive nuclear imaging and iodine uptakes unrelated to pathology, it is very difficult to identify a pelvic metastasis. Our experience of two cases underlines these pitfalls and the possibilities to avoid them: the use of 131 Iodine SPECT/CT whole body scan, peroperative gamma probe and intraoperative frozen sections of specimen.
Conclusion: Preoperative localization needs a precise 3D imaging and the surgical treatment must be guided by a peroperative gamma probe and frozen sections.

Key words: pelvic, metastasis, thyroid, carcinoma, ovarian

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Introduction

Serum thyroglobulin level and radioiodine whole body scan are routinely used for long term follow-up after total thyroidectomy for differentiated thyroid cancers. They can reveal sometimes the distant metastasis after thyroidectomy. Exceptionally, metastasis could be localized in soft tissues and pelvic cavity. This last event complicates the diagnosis, especially in female patients. The iodine uptake could be false positive in some ovarian tumours. We report two cases illustrating these radiologic and therapeutic problems.

cases presented

Case 1.

A 42-years-old female underwent a right hemithyroidectomy in 1983. A 3-cm follicular carcinoma was incidentally discovered. TSH suppression therapy has been conducted without reoperation. Serum thyroglobulin level remained inferior to 5 μg/L (normal 2-70 μg/L) for eight years but it ranged to 75μg/L in 1991. Then, she received a cumulative dose of I-131 of 280 mCi in three sequences (March 1991, October 1991 and November 1995). In these three instances whole body scans only showed left neck uptake. In 1988, serum thyroglobulin level increased to 9538 μg/L (TSH = 39 μU/mL). On the whole body scan, there was no uptake in the thyroid area but we observed only one evident left upper mediastinal uptake. The patient underwent a mediastinal lymph node dissection using sternotomy but cervical reoperation seemed unfeasible. Final pathology concluded to only one metastatic node (2.0 cm - diameters) among 25 other nodes. Patient received a fourth radioiodine administration (60 mCi). In 2000, serum thyroglobulin level was 9877 μg/L (TSH = 68 μU/mL). Whole body scan showed one minimal uptake in the previous mediastinal area and one new marked uptake in the left side of the pelvic cavity. CT scan showed one small mediastinal tumor in the thymic bed behind the sternum and one 2.5x3.5–cm tumor on the left side of uterus. Patient underwent a Pfannenstiel incision removing the left abnormal ovary (October 2000). Pathology concluded to a benign 3.0 cm - fibrothecoma without thyroid ectopic tissue. At this time, it has been concluded that this was the cause of iodine uptake. Six months later, a new CT scan discovered the same left pelvic image. A new whole body iodine scan was performed with different incidences and matched with a bone 99m Technetium scanning using anterior, posterior and lateral views. The uptake area appeared lower than the previous surgical field, exactly inside the pelvic diaphragm (Fig. 1). In June 2001, Iodine123-guided laparotomy was performed through the previous approach with use of an intraoperative probe. Gamma detection probe helped to discover an hypervascularized muscular tumor situated in the levator ani muscle with a very high signal on the probe. We completely removed the tumor. Pathology confirmed a muscular metastasis of follicular thyroid carcinoma. One year later, serum thyroglobulin level was 35.5 μg/L (TSH = 0.02 μU/mL) and whole body scan only showed the previous mediastinal uptake.

Case 2.

A 26-years-old female underwent in 1996 a total thyroidec-

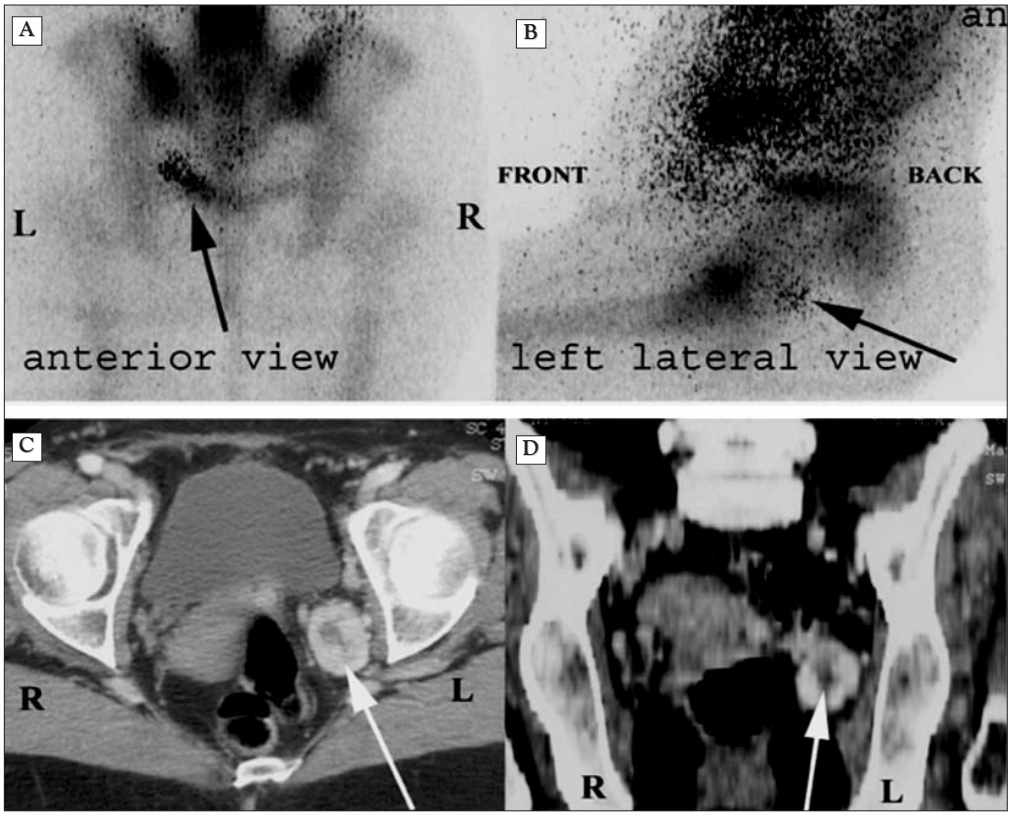


Figure 1. ***(A, B)****: iodine scan matched with bone 99nTc sca,;* ***(C, D):*** *axial and coronal CT scan*

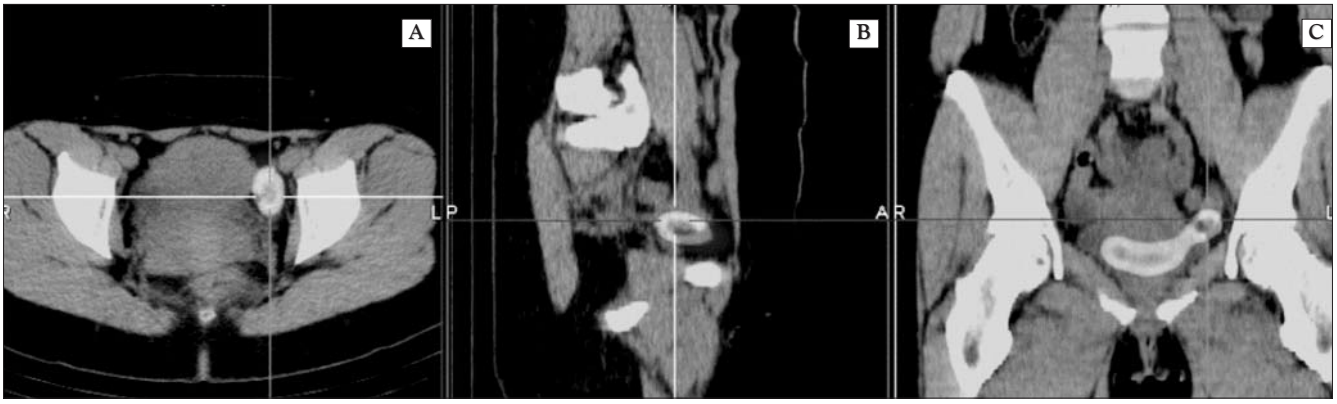


Figure 2. ***(A, B, C)*** *axial, sagital and coronal iodine 1123 SPECT/CT scans*

tomy with central and lateral lymph node dissection (in 1996) for a pT2N1a papillary thyroid carcinoma. Miliary lung metastasis has been proved during the first therapeutic dose of I^{131} (80 mCi). Whole body scan showed bilateral lung uptakes and few minimal uptakes in the thyroid bed. Six months later, serum thyroglobulin level was 158 µg/L (TSH = 122 µU/mL) and this level increased every year despite of five other I^{131} therapeutic doses. In 2007, after eight iodine cures and a cumulative dose of 1000 mCi, serum thyroglobulin level was 17.5 µg/L (TSH = 0.005 µU/mL), anti-thyroglobulin antibodies serum level was 2313 U/ml and the whole body scan showed no more uptake in the neck and thoracic areas but, one new uptake in the left side of the pelvic cavity. Subsequently, dual-modality iodine 123 SPECT/CT scan after recombinant TSH injection brought more information: the uptake focus corresponded to one 2.0 cm tumour between the urinary bladder wall and the left ovary (Fig. 2). Then, a retrograde cystography eliminated a bladder diverticulum and some delay of urinary iodine wash-out. In February 2009, we performed a Iodine123 - guided laparotomy through a Pfannenstiel incision. The palpation revealed two fibrocystic ovaries but nothing included in the urinary bladder muscle nor in the left mesocolon. The left ovary was bigger than the right one and we saw a 2.0 cm benign-seeming heterogeneous tumour but the gamma probe found a very marked signal on its solid part. Complete left ovariectomy was performed. Pathology confirmed an ovarian metastasis of the previously treated papillary thyroid carcinoma. Two months later, serum thyroglobulin decreased to 5.6 µg/L (TSH = 0.05 µU/mL). During the eleventh ablative dose of iodine, whole body scan showed no more pelvic uptake but only a pulmonary one.

Discussion

The incidence of distant metastasis is lower in case of papillary carcinoma (3.5 – 3.8% of cases) than in case of follicular carcinoma (16.4 – 20.0% of cases). For both, distant metastasis concern bones and lungs in 90% of cases. Different other sites have been described, generally in association with bone and lung metastasis.

Delay between diagnosis of thyroid carcinoma and discovery of metastasis could be very long (1). Five cases of muscular metastasis (2,3) and three cases of ovarian metastasis have been reported in the literature (4,5,6). Multiple metastasis lead to radioactive ablation but some of these targets need specific treatments depending of their localisation and on their own risk of evolution. The solitary metastasis can be surgically removed - when it is feasible - avoiding a high cumulative dose of radioactive iodine. Among these rare cases, pelvic metastasis must be specially considered.

During the follow-up of female patient treated for differentiated thyroid carcinoma, the discovery of pelvic uptake on the whole body scan rise with some specific questions.

First, it is necessary to eliminate false positive images due to corporal secretions: saliva on pocket handkerchief and fecal or urinary retention. Asymmetric urinary retention may be due to urinary bladder diverticulum and it could be necessary to propose cystography or cystoscopy (7).

Secondly, some non-thyroid tissues can sometimes uptake iodine. In the pelvic cavity, it has been specifically reported on ectopic gastric mucosa in Meckel's diverticulum and endometriosis.

Thirdly, ectopic thyroid tissue may be included in rectal teratoma or ovarian teratoma. This latter account till 15-20% of all ovarian germ cell tumours. Teratomas are developed from multypotential germ cells and could contain all three germ cell layers. They are classified into immature (malignant), mature (dermoid cyst) and monodermal teratoma (carcinoid, struma ovarii). 15% of teratomas are bilateral. 15% of teratomas contain thyroid tissue and they are called struma ovarii when they fill more than 50% of the complete tumour. Malignant degeneration occurs in 0.1-0.3% of cases (8).

Finaly, metastasis of the differentiated thyroid carcinoma may concern bone or soft pelvic tissue as it is reported in first our case. For all these reasons, anterior and posterior incidence of iodine whole body scan must be completed by lateral view or CT scan. In the first case 1, SPECT/CT scan was not feasible so we have to use lateral views plus bone 99m technetium scan and independent CT scan. Spanu et al. (9) showed that the use of 131 Iodine SPECT/CT scan increases sensibility and specificity of the whole body scan for screening of metastasis and recurrences in the cases of thyroid differentiated carcinoma. This attitude modifies therapeutic

(choice) options in 35.6% of cases and(it) avoids unnecessary treatment in 20.3% of cases (9). Nevertheless, ovarian tumours are not so rare and this case proves that they could coexist with another cause of iodine uptake in the same area.

Our experience underlines this pitfall and on the way to avoid it. For this, preoperative 3D imaging (SPECT/CT) must be done - the intraoperative frozen sections of the specimen are useful but the percentage of thyroid tissue inside ovarian teratoma is sometimes very low and could be difficult to detect. We think that the peroperative gamma probe is mandatory for the guidance of the surgical intervention and allows a large exploration of pelvic cavity and particularly of the both ovaries. The minimally invasive approach is feasible using one short Pfannenstiel incision but to the date we didn't dispose of a probe adapted to laparoscopy in order to decrease the aggressiveness of the surgical treatment.

Conclusion

Pelvic metastases of the differentiated thyroid carcinoma are very rare but represent a specific and difficult problem in female patients. Preoperative localization needs a precise 3D imaging and the surgical treatment must be guided by per-operative gamma probe and frozen sections.

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