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# Diagnosis of metastatic tumours to the thyroid gland by fine needle aspiration biopsy

## Diagnostyka przerzutów nowotworowych do tarczycy za pomocą biopsji aspiracyjnej cienkoigłowej

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## Abstract

**Introduction:** Malignant metastases are rarely found in the thyroid gland, the incidence reaching approximately 2% of all thyroid malignant neoplasms. They are most often caused by tumours of the kidneys, lungs, mammary glands, ovary, and colon or by melanomas. The aim of the study was to evaluate the usefulness of fine needle aspiration biopsy (FNA) for diagnosing tumour metastases to thyroid glands.

**Material and methods:** A total of 15122 patients were operated between 1990 and 2009 for goitres. Malignant neoplasm was diagnosed in 733 (4.8%) patients. Malignant metastases to the thyroid gland were detected in 10 patients, namely 2 men and 8 women aged 48–89 years. The group made up 1.4% of all patients operated for malignant thyroid tumour. Preoperative diagnostic procedure consisted of thyroid scintigraphy, thyroid ultrasonography, and cytology of the material obtained through FNA. In addition, the hormonal activity of the thyroid gland was examined. The range of operation was established through clinical assessment of the tumour, preoperative cytology, and intra-operative histopathology.

**Results:** Among 7 patients with thyroid metastases from renal clear cell carcinoma, as diagnosed postoperatively, cytology of the thyroid material obtained through FNA revealed follicular tumour in 3 (43%) patients, tumour cells in 2 (28.5%) and atypical cells in the other 2 (28.5%). Intraoperative histopathology confirmed the presence of metastasis from renal clear cell carcinoma (1) and indicated thyroid medullary cancer (1), follicular tumour (4), or trabecular adenoma with necrosis (1). Among two patients with thyroid metastases from breast cancer, cytology confirmed a metastasis from breast cancer in one (the woman was disqualified for surgical treatment) and indicated follicular tumour in one. Intraoperative histopathology suggested thyroid anaplastic cancer. Examination of biopsy specimen revealed epithelial cells accompanied by cell atypia in one patient with thyroid metastasis from lung cancer. Intra-operative examination also indicated cellular atypia in the same patient.

**Conclusions:** Follicular tumour diagnosed by fine needle aspiration biopsy in patients after treatment for other cancers, especially renal clear cell carcinoma, should alert the surgeon to the possibility that it could be a metastasis of this cancer to the thyroid gland.

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***Key words:*** *nodular goitre, thyroid cancer, malignant metastases to thyroid gland, fine needle aspiration biopsy*

## Streszczenie

**Wstęp:** Tarczyca może być miejscem odległych przerzutów nowotworowych. Są to zmiany rzadkie stanowiące około 2% wszystkich nowotworów tarczycy. Najczęściej ich przyczyną są nowotwory nerki, płuca, sutka, jajnika, jelita grubego oraz czerniak.

Celem pracy była ocena przydatności biopsji aspiracyjnej cienkoigłowej (BAC) w rozpoznawaniu przerzutów nowotworowych do tarczycy.

**Materiał i metody:** W latach 1990–2009 operowano 15122 chorych z powodu różnych postaci wola. Nowotwór złośliwy rozpoznano u 733 (4,8%) chorych. Przerzuty nowotworowe do tarczycy stwierdzono u 10 chorych (2 mężczyzn i 8 kobiet w wieku od 48–89 lat) — 1,4% nowotworów złośliwych tarczycy. Diagnostyka przedoperacyjna obejmowała badania scyntygraficzne, ultrasonograficzne tarczycy, ocenę cytologiczną materiału pobranego drogą BAC. Badano czynność hormonalną gruczołu tarczowego. Zakres operacji ustalano na podstawie oceny klinicznej guza, wyników badań przedoperacyjnego cytologicznego oraz śródoperacyjnego histopatologicznego.

**Wyniki:** W wyniku BAC tarczycy u 7 chorych z rozpoznanym pooperacyjnie przerzutem raka jasnokomórkowego nerki do gruczołu stwierdzono guz pęcherzykowy (3), komórki nowotworowe (2), komórki atypowe u pozostałych (2). Doraźne badanie histopatologiczne potwierdziło przerzut raka jasnokomórkowego nerki (1), wskazywało na raka rdzeniastego tarczycy (1), nowotwór pęcherzykowy (4) i gruczolak beleczkowaty z martwicą (1). U 2 chorych z przerzutem raka piersi do tarczycy badanie cytologiczne (1) potwierdziło przerzut raka piersi (chora zdyskwalifikowana onkologicznie do leczenia operacyjnego) i wskazywało na guz pęcherzykowy (1). Doraźne badanie histopatologiczne sugerowało występowanie raka anaplastycznego tarczycy. U 1 chorej z przerzutem raka płuca do tarczycy w badaniu bioptatu stwierdzono obecność komórek nabłonkowych i atypię, zaś w badaniu śródoperacyjnym rozległe zmiany martwicze z atypią komórkową.

**Wnioski:** Rozpoznanie w BAC guza pęcherzykowego u chorych po leczeniu innych nowotworów, szczególnie raka jasnokomórkowego nerki powinno wzmóc czujność lekarza w kierunku poszukiwania ewentualnego przerzutu tego nowotworu do tarczycy.

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***Słowa kluczowe:*** *wole guzkowe, rak tarczycy, przerzuty nowotworowe do tarczycy, biopsja aspiracyjna cienkoigłowa*

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## Introduction

An essential and widely accepted method of treating thyroid diseases is surgical treatment [1]. One of the basic indications for surgery is malignant lesion within the thyroid gland [2–4]. Such lesions may either be neoplasms developed primarily in the gland or, rarely, distant metastases from other organs [5–10]. Preoperative knowledge about the goiter characteristics and about tumours and tumour-like lesions within the gland is most important for the surgeon regarding his decision on both the type of surgical management and the extent of the primary procedure [11, 12]. Sonography of the thyroid gland and ultrasound guided fine-needle aspiration biopsy (FNA) play a major role in this process [13–18].

The purpose of this paper is to present the results of FNA used for diagnosis of distant metastases to the thyroid gland.

## Material and methods

A total of 15 122 patients were operated between 1990 and 2009 for thyroid goitre. Malignant tumour was diagnosed in 733 (4.8%) patients. The presence of distant metastases from other primary foci to the thyroid gland was detected in 10 patients (2 men and 8 women) aged 48–89 years (mean age 64.2). The group made up 1.4% of all patients operated for malignant thyroid tumour. Besides physical examination, preoperative diagnostic procedure consisted of thyroid scintigraphy, thyroid ultrasonography, and cytology of the material obtained through FNA. Hormonal activity of the thyroid gland was also examined. The extent of operation was established through clinical assessment of the tumour, preoperative cytology, and intra-operative pathology.

## Results

Among 10 patients with distant metastases to the thyroid gland, 7 (70%) had a metastasis of renal clear cell carcinoma. The interval between operation of the primary tumour and occurrence of the metastasis was 3–10 years (mean time 8.5 years). Moreover, 2 (20%) patients had a metastasis of breast cancer and 1 (10%) patient had a metastasis of lung cancer.

All patients operated for malignant metastases from other organs to the thyroid gland were found to have nodular goitres: 5 of them had giant goitres and 3 had symptoms of superior caval vein syndrome. Ultrasonography revealed the presence of hypoechogenic nonhomogeneous nodules within the enlarged thyroid gland in all patients.

Cytology of the material obtained through FNA from thyroid glands revealed the presence of follicular tumour in 3, the presence of cancer cells in 2, and the presence of atypical cells in 2 of the 7 patients with the postoperatively diagnosed metastases of renal clear cell carcinoma. Furthermore, among 2 patients with a history of breast cancer, one was diagnosed cytologically to have a metastasis to the thyroid gland and the other had a follicular tumour. Examination of biopsy specimens revealed the presence of epithelial cells accompanied by cellular atypia in one patient with lung cancer metastasis. Thus, in total there were 3 cases of definitive diagnosis of metastatic malignant tumours, 4 cases of diagnosis of follicular tumours, and 2 cases of suspicion of neoplasia.

Nine patients received surgical treatment, and one patient was disqualified from further treatment because of breast cancer dissemination.

Intra-operative pathological examination confirmed renal clear cell carcinoma metastasis to the thyroid gland in one patient and diagnosed follicular tumour in four patients, thyroid medullary cancer in one patient, and anaplastic cancer in one patient. The presence of trabecular adenoma with necrosis was diagnosed in one patient and massive necrotic changes accompanied by cellular atypia were present also in one patient (Table I).

Final diagnosis was established based on histopathological examination of the postoperative material (Table I).

## Discussion

Aspiration biopsy of the thyroid gland, guided by ultrasonography, is a very important diagnostic examination of thyroid tumours and an obligatory part of the preoperative management algorithm [13]. Its results enable tumour lesions to be characterized within the thyroid gland. In particular, it helps to differentiate between malignant tumours and benign tumours, this being very important for further treatment [15, 16, 19].

The effectiveness of the preoperative diagnostic process involving cytology of the material obtained by fine needle aspiration biopsy is high, in particular with reference to thyroid papillary cancer. Histopathological verification confirmed the diagnoses established through preoperative biopsy of thyroid tumours in more than 90% of the cases [13–15]. Follicular tumours are more difficult to diagnose [15, 16], but if found by cytology they are considered an indication for operative treatment.

The poorer effectiveness of FNA in preoperative diagnostics may be related to a number of factors including inadequate choice of lesion used for biopsy, size of the lesion, poor cellularity of the obtained cell aspirates,

**Table I.** *Cytological and histopathological examination on metastatic tumours to the thyroid gland*
**Tabela I.** *Wyniki badań cytologicznych i histopatologicznych przerzutów nowotworowych do tarczycy*

| No. | Type of histopathological examination | | |
|---|---|---|---|
| | Cytological (FNA) | Intra-operative | Paraffin |
| 1. | Follicular tumour | Follicular tumour | Metastasis of clear cell kidney cancer |
| 2. | Follicular tumour | Follicular tumour | Metastasis of clear cell kidney cancer |
| 3. | Follicular tumour | Follicular tumour | Metastasis of clear cell kidney cancer |
| 4. | Neoplastic cells | Follicular tumour | Metastasis of clear cell kidney cancer |
| 5. | Neoplastic cells | Medullary cancer | Metastasis of clear cell kidney cancer |
| 6. | Atypia | Papilliform adenoma + necrosis | Metastasis of clear cell kidney cancer |
| 7. | Atypia | Metastasis of clear cell kidney cancer | Metastasis of clear cell kidney cancer |
| 8. | Follicular tumour | Anaplastic cancer | Metastasis of breast cancer |
| 9. | Metastasis of breast cancer | – | – |
| 10. | Atypia | Atypia + necrosis | Metastasis of lung cancer |

or necrotic foci within the tumour. Thyroid metastases from other primary foci are rare; thus, their diagnosis is difficult [15].

For cytological diagnosis of thyroid metastases, it might be most important to carefully consider the history of the patient [8, 9, 20, 21]. As indicated by the material above and the literature data, patients with a history of renal clear cell carcinoma often have metastases of this tumour to the thyroid gland [5, 7, 22]. Such metastases may occur even many years after operation of the original tumour [5, 9, 23]. However, cytological examinations often reveal a follicular tumour whereas final diagnosis is established by examination of the operative material [5, 22, 24, 25]. This has been confirmed by the presented experience.

## Conclusions

Follicular tumour diagnosed by fine needle aspiration biopsy in patients after treatment for other cancers, especially renal clear cell carcinoma, should alert the surgeon to the possibility that it might be a metastasis of this cancer to the thyroid gland.

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