

# Discordant Results in Tc-99m Tetrofosmin and Tc-99m Sestamibi Parathyroid Scintigraphies

## apresentação de caso

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## ABSTRACT

Parathyroid scintigraphies have been used to detect pathological parathyroid glands either before as well as after the parathyroid resection surgery in patients with hyperparathyroidism. One of the most utilized techniques to perform the studies is the double-phase images with Tc-99m sestamibi, which has been shown to be very accurate in the localization of enlarged parathyroid glands. Similar to Tc-99m sestamibi, Tc-99m tetrofosmin is a radiopharmaceutical initially developed to perform myocardial perfusion study that has been used to perform parathyroid scintigraphies. Although most of the papers suggest that the overall sensitivities of both radiopharmaceuticals are similar, there are some papers questioning the accuracy of Tc-99m tetrofosmin to detect abnormal parathyroid glands. In the present article, we report a case with discordant results by both methods. (**Arq Bras Endocrinol Metab 2007;51/7:1166-1168**)

**Keywords:** Scintigraphy; Parathyroid; MIBI; Sestamibi; Tetrofosmin

## RESUMO

### **Resultados Discordantes em Cintilografias das Paratireóides Realizadas com Tetrofosmin-<sup>99m</sup>Tc e com Sestamibi-<sup>99m</sup>Tc**

A cintilografia das paratireóides tem sido utilizada para detectar glândulas paratireóides patológicas tanto antes quanto após (em caso de insucesso) a cirurgia de ressecção em pacientes com hiperparatireoidismo. Uma das técnicas mais utilizadas para realizar este exame é a de duas fases utilizando como radiofármaco o sestamibi-<sup>99m</sup>Tc, a qual tem se mostrado acurada na localização de glândulas paratireóides aumentadas. Similarmente ao sestamibi-<sup>99m</sup>Tc, o tetrofosmin-<sup>99m</sup>Tc é um radiofármaco que foi inicialmente desenvolvido para a realização de cintilografia de perfusão do miocárdio e que tem sido utilizado para a realização de cintilografia das paratireóides. Apesar de muitos artigos sugerirem que as sensibilidades dos dois radiofármacos são idênticas, alguns poucos trabalhos questionam a acurácia do tetrofosmin-<sup>99m</sup>Tc para a localização de glândulas paratireóides anômalas. No presente artigo, relatamos um caso em que foi observado resultado discordante pelos dois métodos. (**Arq Bras Endocrinol Metab 2007;51/7:1166-1168**)

**Descritores:** Cintilografia de paratireóides; Paratireóide; MIBI; Sestamibi; Tetrofosmin

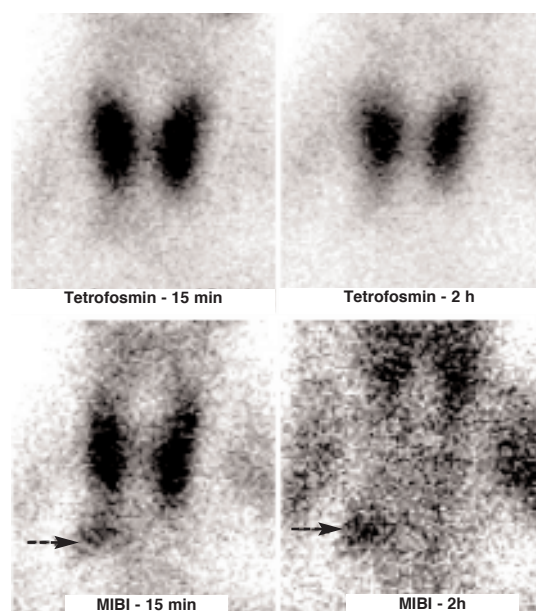
PARATHYROID SCINTIGRAPHY IS USUALLY performed in patients with recurrent hyperparathyroidism after the resection of the parathyroid glands or as a pre-operative “roadmap” to shorten the duration of surgery and the length of the incision (1-3). There are different techniques to perform parathyroid scintigraphies. One of the most utilized is the double-phase image with Tc-99m sestamibi (sestamibi). This technique has been

Recebido em 02/04/07  
Aceito em 21/06/07

shown to be very accurate in the localization of parathyroid adenomas. Similar to sestamibi, the Tc-99m tetrofosmin (tetrofosmin) is a radiopharmaceutical initially developed to perform myocardial perfusion study that has been used to perform parathyroid scintigraphies. There are papers comparing the double-phase parathyroid scintigraphy with sestamibi with that performed with tetrofosmin. These papers suggest that there is a difference in the washout of the radiopharmaceutical from the thyroid tissue, with a delay washout with tetrofosmin, but the overall sensitivities of the methods are reported to be similar (4-10). However, there are some papers questioning the accuracy of tetrofosmin to detect abnormal parathyroid glands (11,12). In our short experience with tetrofosmin, we observed potential limitations of this radiopharmaceutical agent as a marker for enlarged parathyroid gland.

### CASE REPORT

A 65-year-old woman with high serum calcium (11.7 mg/dL — normal range from 8.4 to 10.2 mg/dL) and PTH (250 pg/mL — normal range from 10 to 65 pg/mL) concentrations showed a negative double-phase parathyroid scintigraphy with tetrofosmin (figure 1). Since we have little experience with double-

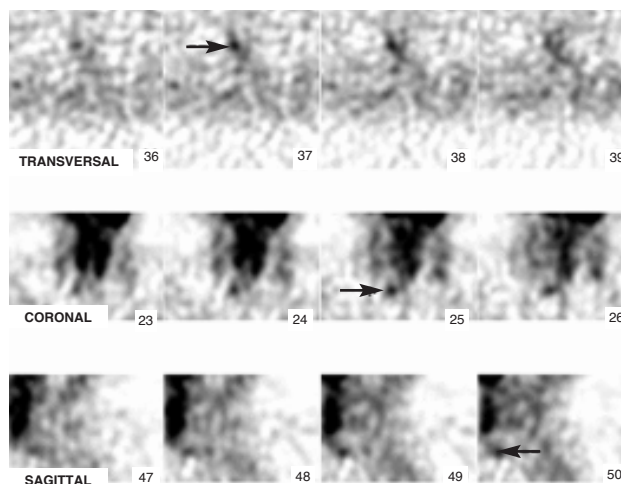


**Figure 1.** The parathyroid scintigraphy performed with Tc-99m tetrofosmin (upper row) and Tc-99m sestamibi (lower row) are presented. There is a region with Tc-99m sestamibi (MIBI) uptake (arrow) inferior to the right thyroid lobe. There is no similar uptake on the scintigraphy performed with Tc-99m tetrofosmin.

phase parathyroid scintigraphy with tetrofosmin (as opposed to sestamibi), and as there was a high probability of a positive parathyroid scintigraphy result with sestamibi with such high levels of calcium and PTH (13,14), another parathyroid scintigraphy with sestamibi was performed one week later. The second study demonstrated a region of slight sestamibi uptake (arrow) inferior to the right thyroid lobe (figure 1). The SPECT images (figure 2) of the parathyroid scintigraphy with sestamibi confirmed a focal uptake inferior and posterior to the right thyroid lobe (arrows). A parathyroid adenoma in this location was surgically removed one month later. After the surgery, calcium and PTH plasmatic concentrations fell to 8.5 mg/dL and 49 pg/mL, respectively.

### DISCUSSION

Tetrofosmin is a radiopharmaceutical similar to sestamibi that has been extensively used to perform myocardial perfusion studies. Once sestamibi has been also used to perform parathyroid scintigraphy studies, some researchers have analyzed the usefulness of tetrofosmin in this last application. Although most of the articles show that the overall sensitivities of the methods are similar (4-10), there are some papers questioning the accuracy of tetrofosmin to detect abnormal parathyroid glands (11,12). In the case herein report-



**Figure 2.** The SPECT images from the parathyroid scintigraphy with Tc-99m sestamibi confirmed a focal uptake localized inferior and posterior to the right thyroid lobe (arrows).

ed the results of both methods were discordant with a false-negative finding on tetrofosmin. The reason for these discordant results could be the differences in the washout kinetics of them. Arbab et al. (15,16) found in both myocardial and tumor cells that only a part of the accumulated tetrofosmin entered the mitochondria, whereas most of the sestamibi accumulation was related to mitochondrial uptake. This difference in mitochondrial accumulation could be the cause of the discordance in the results of these two radiopharmaceuticals, when used to perform parathyroid scintigraphy.

### CONCLUSION

Although tetrofosmin and sestamibi are similar radiopharmaceuticals, there are discordant findings on parathyroid scintigraphy studies. In the case here reported, sestamibi was superior to tetrofosmin.

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