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pHPT. The aim of our study is to evaluate the value of a second pre-operative ^{99m}Tc-MIBI in persistent sporadic pHPT and the interest of the adjunction of US.
Patients and Methods
Fifty patients operated on between 2006 and 2016 in three French University Hospitals (Nantes, La Pitié Salpêtrière, Paris and Angers) were included in this study. All patients had a persistent sporadic pHPT after a first surgery and have been re-operated on.A ^{99m}Tc-MIBI was performed in each case before the first and the second operation. US was always performed before the first operation and in 43 patients before re-operation. The cure rate (following second ^{99m}Tc-MIBI and second surgery), the number of new pathologic localized glands, and the intrinsic properties of second ^{99m}Tc-MIBI to localize the side of an abnormal parathyroid gland were evaluated. Intrinsic properties of ^{99m}Tc-MIBI and US were also evaluated.
Results
Forty-two patients (84%) were cured after the second surgery. Among these, 31 (62% of the patients) had a gland removed on the area identified by second-MIBI. Twenty-six new pathologic glands (52%) were identified by second-MIBI, including 18 patients (36%) with a multiglandular disease and 8 patients (16%) with a negative first-MIBI. Overall intrinsic properties of the second-MIBI are 67% sensitivity (se), 91% specificity (sp), 82% positive predictive value (PPV) and 81% negative predictive value (NPV). Performing the second-MIBI one year or more after the first -MIBI provided important sp: 97% vs 86% when second-MIBI was performed in the first year, and PPV: 93% vs 77%, but with a decreased sensitivity (59% vs 71%) and NPV (79% vs 82%). Concordant second-MIBI and US (17 patients) had the better se (77%), 85% sp, 77% PPV and 85% NPV.
Conclusion
Performing a second ^{99m}Tc-MIBI leads to find new pathologic glands in more than 50% of the cases in sporadic pHPT, especially in multiglandular disease. The concordant couple ^{99m}Tc-MIBI and US is the most accurate examination to localize the side of an abnormal parathyroid gland before re-operation. When discordant, the ^{99m}Tc-MIBI performed more than one year after the first-MIBI has the best specificity and NPV.

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GP18

Calcium to Phosphorus (Ca/P) ratio as an accurate index for the diagnosis of primary hyperparathyroidism (PHPT) and hypoparathyroidism (HypoPT)

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Background
The diagnosis of PHPT and chronic HypoPT is still challenging, mainly due to the wide spectrum of clinical and biochemical presentation and the lack of validated diagnostic index in literature. The serum Ca/P ratio has been proposed as an accurate tool to diagnose PHPT in a small sample of patients, while no data is available about its possible application for HypoPT.
Aim
To validate the serum Ca/P ratio as a diagnostic index for PHPT and to investigate its diagnostic performance in the diagnosis of HypoPT by analyzing a large series of data coming from a multicenter study.
Methods
Multicenter, retrospective, case-control study, including 432 PHPT patients and 217 HypoPT patients, compared with 389 controls. Main outcomes: serum Ca, P, albumin, creatinine, parathyroid hormone (PTH) and 25-OH vitamin D (only for controls and PHPT). *Statistical analysis:* Comparisons among groups were performed by the nonparametric Kruskal-Wallis, followed by the Dunn's post hoc test. The diagnostic accuracy of Ca/P ratio was investigated by receiver operator characteristics (ROC) curves in order to define cut-off points (with the highest sensitivity and specificity).
Results
The Ca/P ratio was significantly different among groups, resulting higher in PHPT and lower in HypoPT patients than controls ($P<0.0001$). At ROC curve analysis, the Ca/P ratio above 3.3 was defined for the diagnosis of PHPT (sensitivity 85.7%, specificity 85.3%), while the Ca/P ratio below 2.3 for the diagnosis of HypoPT (sensitivity 88.2%, specificity 87.9%). Considering the PHPT group, the cut-off of 3.1 for Ca/P was able to specifically identify patients with normocalcemic PHPT (sensitivity 80.3%, specificity 80.2%).
Conclusions
This study further validates the serum Ca/P ratio as a highly accurate diagnostic index for PHPT, defined by Ca/P above 3.3. For the first time, a Ca/P ratio below 2.3 is proposed to identify HypoPT patients. Our findings confirm the reliability of this index to screen and/or rule out disorders of Ca-P metabolism.

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GP19

18F-Fluorocholine PET/CT in patients with primary Hyperparathyroidism and negative or inconclusive 99mTc-MIBI parathyroid scan: clinico-pathological correlations

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Introduction
The gold standard for evaluating Occult Parathyroid Adenomas (OPa) in patients with biochemical pattern of primary hyperparathyroidism (PHPT) is the 99mTc-MIBI parathyroid scan. 18F-Fluorocholine (18F-FCH) PET/CT has been proposed as a potential technique for detection and localization of OPa when 99mTc-MIBI scan is negative or inconclusive.
Aims
To evaluate sensitivity and positive predictive value of 18F-Fluorocholine PET/CT in patients with biochemical PHPT with negative or inconclusive 99mTc-MIBI scan. To correlate 18F-FCH PET/CT findings with clinical and surgical characteristics.
Methods
We analyzed all subjects with biochemical PHPT attended in our department (January–December 2018) with a negative/inconclusive 99mTc-MIBI in which 18F-FCH PET/CT was performed. Patient characteristics, time of diagnosis of PHPT, serum calcium and parathyroid hormone (PTH) levels were recorded. In those patients who underwent parathyroidectomy, affected glands, type of surgery, postoperative serum calcium, PTH levels and pathological features were correlated with 18F-FCH PET/CT findings. Differences were considered significant for a*p value* <0.05. SPSS Statistics package was used for statistical analysis (Mann-Whitney, Chi-square and T student tests).
Results
A total of 23 subjects with biochemical PHPT with negative ($n=19$) or inconclusive ($n=4$) 99mTc-MIBI scan were included (74.47% female, 61.4 ± 14.7 years, time since diagnosis 24.7 ± 30 months, 17.4% with previous unsuccessful surgery, calcium 2.69 ± 0.18 mmol/l, PTH 21.75 ± 28 pmol/l, 3 subjects with MEN1 and 1 with familiar PHPT). 18F-FCH PET/CT was positive in 18 patients, negative in 4 and inconclusive in 1. No differences were found between subjects with positive and negative 18F-FCH PET/CT in the analyzed variables (a tendency to higher PTH was observed in subjects with positive 18F-FCH PET/CT ($P=0.057$)). Parathyroidectomy was performed in 12 patients (11 patients are pending of surgery), resulting in 10 cases a solitary OPa by pathology. OPa were located 6 in the left upper gland, 2 in the left lower gland and 2 in the right lower gland. 18F-FCH PET/CT localization was concordant with the excised OPa in all patients except for one case. In one case of failed surgery PET indicated an ectopic gland and in the other case a left low gland. Moreover, elevated preoperative PTH and serum calcium decreased 10 minutes after surgery.
Conclusions
In our series of patients with biochemical PHPT and negative/inconclusive 99mTc-MIBI parathyroid scan, 18F-FCH PET/CT offers greater sensitivity and precision during performance of parathyroidectomy (sensitivity 78.2%, positive predictive value 83.3%). No clinical or biochemical data was associated with PET positivity.

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