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Pituitary Tumors - Epidemiology and the Diagnostic Value of ^{68}Ga-DOTATOC-PET

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademin, Göteborgs universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Medicinaregatan 3, den 11:e december 2020, klockan 09:00

av Axel Tjörnstrand

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Avhandlingen baseras på följande delarbeten

I. Tjörnstrand A, Gunnarsson K, Evert M, Holm E, Ragnarsson O, Rosén T, Filipsson Nyström H.
The incidence rate of pituitary adenomas in western Sweden for the period 2001–2011.
European Journal of Endocrinology 2014; 171:519-526

II. Tjörnstrand A, Casar-Borota O, Heurling K, Schöll M, Gjertsson P, Himmelman J, Itsenko O, Ragnarsson O, Filipsson Nyström H.,
Lower ^{68}Ga-DOTATOC uptake in nonfunctioning pituitary neuroendocrine tumours compared to normal pituitary gland - a proof-of-concept study.
Clinical Endocrinology 2020;92:222-231

III. Tjörnstrand A, Casar-Borota O, Heurling K, Schöll M, Gjertsson P, Ragnarsson O, Filipsson Nyström H.,
Pre- and postoperative ^{68}Ga-DOTATOC positron emission tomography for hormone-secreting pituitary neuroendocrine tumors
Submitted

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Pituitary Tumors - Epidemiology and the Diagnostic Value of ^{68}Ga-DOTATOC-PET

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Abstract

Pituitary neuroendocrine tumors (PitNETs) are considered common in the general population. However benign in most cases, these tumors can evoke dramatic morbidity in patients with aggressive tumor growth and/or excess hormone secretion. Both the primary diagnostic and the post-operative imaging assessment face difficult challenges with today diagnostic methods. Also, modern epidemiological data is scarce in publications regarding these tumors and needs to be updated. The overall aim of this thesis was to study regional PitNET incidence and epidemiological data, and to describe the pre- and post-operative diagnostic properties of ^{68}Ga-DOTATOC-PET.

Paper I was an observational cohort study presenting data from 592 adult PitNET patients living in the Västra Götaland Region diagnosed between 2001-2011. Papers II-III were prospective, case-controls studies evaluating ^{68}Ga-DOTATOC tracer uptake in patients with PitNETs and healthy control subjects. Uptake data was analyzed in relation to immunohistochemical data of cell type and somatostatin receptor (SSTR) expression. In Paper I, we found the standardized incidence rate (SIR) of PitNETs during the study period was 3.9 cases/100,000/year, which was higher than previously reported from the same region. Non-functioning PitNETs were the most commonly diagnosed (54% of tumors) followed by lactotroph (32%), somatotroph (9%), corticotroph (4%, and thyrotroph (0.7%) tumors. ^{68}Ga-DOTATOC uptake correlated with SSTR2 expression. Tumor uptake was higher in thyrotroph tumors, lower in in gonadotroph and corticotroph tumors in comparison to the uptake in normal pituitary tissue. In tumors with high preoperative tracer uptake (>13.8 SUVmax) the tracer was able to predict clinical remission if post-operative uptake was reduced under 60% of the pre-op scan.

In conclusion, PitNET SIR was higher compared to previously reported data from the same region before MRI became clinical routine. ^{68}Ga-DOTATOC can be used to differentiate corticotroph, gonadotroph, and thyrotroph tumors from normal pituitary gland. Post-operative scans suggest clinical value in predicting remission but need to be studied further.

Keywords: positron emission tomography, PET, ^{68}Ga-DOTATOC, pituitary tumors, SSTR imaging, pituitary neuroendocrine tumor, PitNET

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