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# Age disparities in referrals to specialist surgical care for papillary thyroid cancer

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**Abstract**

*Aims*: Referrals to specialist surgical care for papillary thyroid cancer are significantly influenced by patient age and the presence of lymph node metastases. This study sought to clarify whether younger patients with papillary thyroid cancer are referred more often because of their more frequent and more numerous lymph node metastases or because of age alone.
*Methods*: Analysis of 832 consecutive patients with papillary thyroid cancer referred to a tertiary surgical center in Germany between 1994 and 2009.
*Results*: Age (especially when categorized at 30 years) and lymph node metastases were independently associated with referral distance. Younger age was consistently correlated with greater referral distance. The effect of age was stronger in node-negative patients referred for initial operations and weaker in node-positive patients referred for reoperations. Conversely, lymph node metastases were associated with greater travelling distance, more in older than younger patients referred for reoperations, but did not seem to play any role in referrals for initial operations.
*Conclusions*: Despite their better prognosis, younger patients with papillary thyroid cancer were referred to specialist care across significantly greater distances, regardless of their lymph node status, than older patients who have a worse prognosis. The causes underlying these age disparities in referrals to specialist care warrant further research.


*Keywords:* Papillary thyroid cancer; Extent of disease; Lymph node metastasis; Age disparities

## Introduction

For many, usually more sophisticated interventions, distance to a referral center is an important determinant of how intensively specialist resources are utilized. Semiquantitative research indicated the existence of a two-way referral bias in patients with lymphoma residing near a specialist center or at a distance[1] and patients with papillary thyroid cancer living in postal code regions clustered according to distance[2]: the greater the distance the more advanced the disease and the younger the patient.

From a public health perspective, discrimination by extent of disease is desirable in deciding whom to refer for specialist care, concentrating health care resources on those patients believed to be in greatest need of them. Conversely, the presence of age disparities in referrals for a given condition may arouse concern because of the suggestion that a certain group of patients, such as the elderly, may be put at a disadvantage by withholding care they depend on. Indeed, patients with differentiated thyroid cancer aged more than 60 years suffer higher rates of locoregional and distant recurrence and have a bleaker prognosis than younger adults.[3] Conversely, children and adolescents with papillary thyroid cancer reveal more often node-positive tumors with more positive nodes than adults. In these patients, conceivably, young age may simply reflect the presence of more positive nodes or more extensive disease.

Statutory and private health insurance in Germany cover physician and hospital fees for all recognized surgical and medical treatments nationwide, with no geographic limitations attached. Still, travelling costs may not always be covered in full, and sometimes are not refunded at all. Under these seemingly quasi-ideal conditions, non-monetary factors, such as extent of disease, should drive decisions to refer patients for specialist care. In order not to lose

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information, quantitative analyses of factors relevant to decisions to refer for specialist surgical care should be based on absolute, rather than categorized, distance between two sites.

A systematic review of the pertinent literature suggests that such quantitative analyses have not yet been conducted. The current investigation aimed to quantify the independent contributions of age and lymph node metastases in referrals to a specialist surgical center for papillary thyroid cancer.

## Patients and methods

### *Study population*

A total of 832 consecutive patients with papillary thyroid cancer were referred between November 1994 and March 2009 to this institution. Initial operations were performed on 291 patients who revealed tumors with a mean tumor size of 14 mm, 41% of which were node-positive. Reoperations were carried out on 541 patients who displayed tumors with a mean tumor size of 24 mm, 53% of which were node-positive. The study population encompassed 653 patients with papillary thyroid cancer previously included in a semi-quantitative analysis of factors influencing referral patterns in papillary, follicular and medullary thyroid cancer.[2] For papillary thyroid cancer, this study consistently identified age and presence of lymph node metastases as the sole factors consistently varying with distance to the referral center, without assessing their independent impacts on referral distance.

### *Extent of dissection*

Total thyroidectomy was or had been carried out in 779 patients (94%), and less extensive thyroid resection in 53 patients (6%). Of the 832 patients, 669 patients (80%) underwent systematic dissection of the central cervical lymph node compartment, as described elsewhere.[4] The lateral cervical compartments were dissected in 323 (39%; ipsilateral) and 117 patients (14%; contralateral), and the mediastinal compartment in 36 patients (4%), respectively. At least one of the four lymph node compartments of the neck and mediastinum was or had been dissected in 702 patients (84%) of the study population. All clinical interventions represented standard practice of care and agreed with the practice guidelines of the German Society of Surgery.[5] Before surgery, informed consent was obtained from the patients or their legal guardians for each procedure in accord with the ethical standards of the Helsinki Declaration of 1975.

### *Histopathologic examination and staging*

All specimens were subjected to histopathologic examination. A diagnosis of lymph node metastasis always required histopathologic confirmation. Lymph node yield, i.e. the ratio of positive to removed nodes, from both initial operations and from reoperations was calculated based on those nodes dissected at this institution, discounting all nodes excised elsewhere. The thyroid halves were sectioned horizontally from the superior to the inferior pole, as described previously.[6] After fixation in formalin, the whole thyroid gland was embedded in paraffin. Soft tissue and lymph nodes were processed separately. Conventional staining (hematoxylin and eosin) and, where appropriate, thyroglobulin immunohistochemistry were performed on every surgical specimen, using the standard avidin–biotin complex peroxidase approach. Papillary thyroid cancers were diagnosed according to the World Health Organization histologic classification of tumors.[7]

### *Location of, and distance to, the specialist surgical center*

The Department of General, Visceral and Vascular Surgery is located in Halle (Saale), a city with a population of 230,000. Because of its geographic location, the Department can receive referrals from all four cardinal points from a distance of 200 km (125 miles); and from 3 cardinal points from a distance of 400 km (250 miles). The maximum distance – for referrals from South-Western Germany – was 530 km (330 miles). For the purpose of the study, referrals from abroad were disregarded.

The distance from the patient's place of residence to the referral center (Halle) was measured with the use of an internet-based inter-city distance calculator accessible for free at *http://www.postleitzahl.org/entfernung.html* and rounded to the nearest kilometer. The calculator algorithm approximates the linear distance between two cities, the points of reference being the city centers. For Halle residents referred within the city of Halle, the calculator algorithm accordingly sets inter-city distance to zero. Nearest distance from a residence outside Halle to the specialist surgical center in Halle was 10 km (6 miles). Altogether, 346 patients (42%) were referred from within a perimeter of up to 100 km (60 miles); 196 patients (24%) from between 101 km (60 miles) and 200 km (125 miles); 112 patients (13%) from between 201 km (125 miles) and 300 km (190 miles); 140 patients (17%) from between 301 km (190 miles) and 400 km (250 miles); and 38 patients (4%) from more than 400 km (250 miles) away.

### *Statistical analysis*

Categorical and continuous data were tested on univariate analysis using the two-tailed Fisher's exact test and one-way analysis of variance (ANOVA), respectively. Spearman rank correlation coefficient ($\rho$) was calculated to assess correlations between categorical and metric variables. The level of statistical significance (all values were two-tailed) was set at $<0.05$.