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Effects of surgical volumes on the survival of endometrial carcinoma

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HIGHLIGHTS

- This study showed no relation between surgical volumes and survival of endometrial cancer.
- At this moment there is insufficient evidence that concentration of care for women with endometrial cancer leads to improved survival.

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ABSTRACT

Objective. This study aims to assess whether surgical volume is related to survival among women with endometrial carcinoma.

Methods. For this population-based retrospective study, all women diagnosed with endometrial carcinoma between January 2005 and December 2010 were included as registered in the Netherlands Cancer Registry. Hospitals were divided into type of hospital: small general, large general, and oncological referral hospitals and into surgical volume: low (<15/year), medium (15–24/year) and high (≥25/year) volume hospitals depending on the average annual number of surgeries for endometrial carcinoma during the study period. Primary outcome was relative survival related to hospital volume.

Results. Of 9133 women, 2596 (24.4%) were surgically treated in low volume hospitals, 3530 (38.7%) in medium volume hospitals and 3007 (32.9%) in high volume hospitals. In the Netherlands, low risk endometrial cancer is typically treated with simple hysterectomy and bilateral salpingo-oophorectomy whilst lymphadenectomy is only performed in high-risk endometrial cancer. Hospitals with high volumes treated relatively more women with high-risk and advanced stage tumors. After corrections for age, stage, histology, grade and type of hospital, no differences in relative survival were found by hospital volume in the total group or in the women with high-risk endometrial cancer, nor in women treated with complex surgery for endometrial cancer.

Conclusions. In this large population based study, no relation between surgical volumes and relative survival of endometrial cancer was observed. Based on this study, we conclude that at this moment there is insufficient evidence that concentration of care for women with endometrial cancer would lead to improved survival.

1. Introduction

Endometrial carcinoma is the most common gynecological malignancy with an incidence of 82,500 newly diagnosed women and 21,700 disease specific deaths per year in Europe [1]. Due to a relatively early detection and good prognosis of early stage disease, the mortality rate is relatively low. Bokhman et al. classified endometrial cancer into two groups: Type 1 endometrioid endometrial carcinoma (EEC), the most common, is considered to be hormone-dependent and has a relatively good prognosis, versus type 2 EEC which consists of the non-endometrioid type carcinomas like serous and clear cell endometrial carcinomas [2]. The type 2 endometrial carcinomas are known to be to be less hormone dependent and have a less favorable prognosis. Since several studies show that poorly differentiated (grade 3) endometrioid-type carcinomas have a more aggressive behavior, comparable to the non-EEC type carcinomas, one could also divide the endometrial carcinomas into a low-risk group, which consists of grade 1 and grade 2 endometrioid-type carcinomas, and into a high risk group, which consist of grade 3 EEC and non-EEC endometrial carcinomas [3]. Recent data of the Cancer Genome Atlas Research network demonstrated that this dualistic model is too simplistic and propose to categorize them based on their molecular profile [4]. However, these data have not been incorporated in clinical practice yet.

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Although corrected age-standardized corpus uteri cancer mortality rates have decreased significantly over the past decade in most European member states [5], survival for high-risk and advanced endometrial cancers has not been improved [6].

In order to improve cancer survival, centralization of surgical treatment of several cancer types has been the issue of debate in recent years. Centralization is thought to increase the quality of care as it is assumed that higher numbers of surgical procedures are needed to maintain the surgeons operating skills. This hypothesis was confirmed in studies about the effects of surgical volumes of esophagus and gastric cancers [7], in a study on bladder cancer [8] and to a lesser extent a positive correlation was also observed in studies on esophagus [9], pancreas, lung and bladder cancers [10]. However, studies on the effect of surgical volumes in gynecological malignancies show mixed results.

Although no differences were found in survival between high and low volume surgeons or hospitals for endometrial cancer surgery [11], higher surgical volumes have been found to improve survival for more complex surgical procedures, as for treating ovarian carcinoma [12,13].

For the treatment of endometrial cancer, there are no official regulations for centralization. In The Netherlands, patients with low risk endometrial cancer are treated in all hospitals, whereas patients with high-risk endometrial cancer are referred regularly to a tertiary referring partner for the possibility of advanced surgery.

Surgical treatment for endometrial cancer ranges from simple hysterectomy with bilateral salpingo-oophorectomy to radical hysterectomy with lymphadenectomy and debulking procedures dependent on type of endometrial cancer and stage of disease. Since several studies have shown that routine lymphadenectomy does not improve survival for endometrial cancer [14,15], in the Netherlands, low risk endometrial cancer is typically treated with simple hysterectomy with bilateral salpingo-oophorectomy without lymphadenectomy. Complex surgical procedures are mainly performed for some of the high risk and expected advanced-stage endometrial cancers.

Because of the more aggressive nature of high-risk endometrial cancers and the more complex surgical procedures, we hypothesized that patient survival of high-risk endometrial carcinomas, and the surgical volumes of the treating hospital could affect the survival of women treated with complex surgery for endometrial carcinomas. If so, centralizing the treatment for this group of patients could be the next step in optimizing women's care for endometrial carcinomas in the Netherlands.

The aim of the current study was to describe the current variation of surgical volumes of Dutch hospitals treating women for endometrial cancer and to determine whether surgical volume is related to survival for endometrial cancer in general, high-risk endometrial cancer and for women treated with complex surgery for endometrial cancer.

2. Materials and methods

2.1. Design and patients

In this population-based retrospective study, all women diagnosed with endometrial carcinoma between January 2005 and December 2010 in The Netherlands were selected. Only women who were surgically treated were included. Of all registered corpus uteri malignancies, we included endometrioid-type, clear cell-type, serous-type and mixed-type endometrial carcinomas (appendix), since these types contribute to over 98% of endometrial carcinomas. All other types of endometrial carcinomas were excluded from analysis. Women with missing data regarding hospital of treatment were also excluded from analyses.

2.2. Data collection

Data were retrieved from the Netherlands Cancer Registry (NCR), which is maintained by the Comprehensive Cancer Organization the Netherlands (IKNL). The NCR documents all newly diagnosed tumors in the Netherlands and has a national coverage since 1989. Notification is mainly obtained from the automated nationwide pathology archive (PALGA). Additional sources are the national registry of hospital discharges, hematology departments and radiotherapy institutes. After notification, information on patient characteristics, including age, tumor characteristics and treatment is routinely collected from patient medical records by specially trained registrars. Regular consistency checks are performed to ensure the quality of the data in the NCR. The quality of the data is high and completeness is estimated to be at least 95%.

The following tumor characteristics registered by the Netherlands Cancer Registry were used: topography, morphology, pre-operative tumor stage according to the FIGO and TNM classification and tumor grade. Topography and morphology of the tumor were coded according to the International Classification of Diseases for Oncology ICD-O [16] and the Tumor Node Metastasis (TNM) classification was used for staging [17]. Tumor stages were registered according to the FIGO 1988 classification until December 2009 and according to the FIGO 2009 classification from January 2010. Where appropriate, we converted the FIGO 1988 classification to the FIGO 2009 classification. Endometrial cancer was divided into low risk endometrial cancer for grade 1 and grade 2 endometrioid type carcinomas, or into high-risk endometrial cancer for grade 3 endometrioid and non-endometrioid type endometrial carcinomas.

Type of surgery was registered nationwide within specific categories (appendix) and we chose to divide surgery type in non-complex surgery (hysterectomy with or without removal of the adnexa) and complex surgery. Surgery was scored as complex if debulking surgery or radical hysterectomy was registered or when the medical charts or pathological examination mentioned the removal of one or more lymph nodes.

The average number of treated endometrial carcinomas in the study period per hospital per year was calculated. First the most complicated treatment per patient for her initial tumor (not recurrences) was defined. Hospitals that treated less than 15 women per year were defined as “low-volume” hospitals, 15–24 as “medium-volume hospitals,” and ≥25 as “high-volume hospitals.”

However, since the Dutch medical authorities have set a minimum amount of 20 surgically treated ovarian, cervical and vulvar carcinomas per year per hospital as a norm for good quality of care [18], we have performed a sensitivity analysis by dividing the hospitals in low volume hospitals (<20) and high-volume hospitals (≥20).

Hospitals were further categorized into three subcategories: tertiary oncological referral hospitals, including academic centers; large teaching hospitals (LTH); and small general (teaching and non-teaching) hospitals.

Information regarding vital status and date of death is obtained from the Registration Municipal Personal Records Database. The primary outcome was relative survival related to hospital volume.

We decided not to correct for adjuvant treatment modalities (radiotherapy, chemotherapy and/or hormone therapy), because we believe this would result in over-correcting since we did correct for stage and tumor grade and these are closely related to adjuvant treatment. We did plan to correct for socio-economic status, but we only had information about the first four numbers of the zip code which give information about the city and district, but not the neighborhood or street. Therefore we have only performed a sensitivity analysis correcting for the average house prices that belong to the first four numbers of the zip code.

2.3. Statistical analysis

Patient characteristics were compared between the three hospital volume using *t*-tests for continuous and χ^2 tests for categorical variables.

Relative survival was used as an estimate for disease-specific survival. Relative survival is calculated by dividing the overall survival after diagnosis by the survival as observed in a similar population that