Clinical Oncology xxx (2016) 1–9

Contents lists available at ScienceDirect

Clinical Oncology

journal homepage: www.clinicaloncologyonline.net

Original Article

Patterns of Referral to Radiation Oncology among Patients with Bladder Cancer: a Population-based Study

J.S. Quirt [*], D.R. Siemens [†‡], K. Zaza [†], W.J. Mackillop [*†§], C.M. Booth [*†§]

[*] Division of Cancer Care and Epidemiology, Queen's University Cancer Research Institute, Kingston, Canada
[†] Department of Oncology, Queen's University, Kingston, Canada
[‡] Department of Urology, Queen's University, Kingston, Canada
[§] Department of Public Health Sciences, Queen's University, Kingston, Canada

Received 15 July 2016; received in revised form 19 September 2016; accepted 20 September 2016

Abstract

Aims: Radical radiotherapy is a reasonable alternative to cystectomy for some patients with invasive bladder cancer, and postoperative radiotherapy may be indicated in patients at high risk of local recurrence. Here we describe pre- and postoperative radiation oncology consultation among patients with bladder cancer in Ontario.

Materials and methods: Records of radiotherapy and surgery were linked to the Ontario Cancer Registry (OCR) to identify all patients who received treatment with curative intent for bladder cancer between 1994 and 2008. Billing records were linked to the OCR to determine which patients were seen by radiation oncology before radical therapy or after cystectomy. Factors associated with radiation oncology consultation were explored by logistic regression.

Results: In total, 5259 patients with bladder cancer underwent treatment with curative intent in Ontario between 1994 and 2008. Of these, 3879 had primary cystectomy and 1380 had primary radiotherapy. Thirty-two per cent (1698/5259) of all patients were seen by radiation oncology. Independent factors associated with radiation oncology consultation included advanced age ($P < 0.001$), greater comorbidity ($P < 0.001$) and earlier year of diagnosis ($P < 0.001$). Rates also varied widely across geographical regions (range 20–57%); this variation was highly significant on multivariate analysis ($P < 0.001$). Only 10% (370/3759) of patients with cystectomy had a preoperative radiation oncology consultation. Ten per cent of patients treated by cystectomy (386/3879) were seen by radiation oncology in the postoperative setting; rates varied widely across regions (range 6–44%). These geographical variations were highly significant in the multivariate analysis ($P < 0.001$), which also showed that younger patients, those with higher stage (pT or pN), and those with positive margins, were more likely to have a postoperative radiation oncology consultation (all $P < 0.001$). Only 19% (80/420) of cases with positive margins had a postoperative radiation oncology consultation.

Conclusions: One third of all patients with muscle-invasive bladder cancer in routine practice were seen in consultation by radiation oncology. Few patients who undergo cystectomy have the benefit of either a preoperative or a postoperative opinion about the potential role of radiotherapy in their management. Closer collaboration between radiation oncologists and urologists is warranted.

Key words: Bladder cancer; guideline concordance; multidisciplinary care; quality of care; radiotherapy; surgery

Introduction

Options for definitive therapy for localised muscle-invasive bladder cancer (MIBC) include cystectomy or radical radiotherapy, either alone or in combination with chemotherapy. Contemporary bladder-preserving approaches in patients with clinically staged MIBC can achieve complete response rates of 60–80%, with 5 year overall survival rates of 60–80% and bladder intact survival rates of 40–45% [1,2]. Large institutional case series report comparable long-term survival for patients treated with cystectomy [3–5]. In a British Institute of Urology randomised trial, there was no statistically significant difference in survival between the two treatment approaches [6]. There is no contemporary level I evidence to support one modality over the other and it is unlikely that such evidence will emerge in

Author for correspondence: C.M. Booth, Division of Cancer Care and Epidemiology, Queen's University Cancer Research Institute, 10 Stuart Street, Kingston, ON, K7L 3N6, Canada. Tel: +1-613-533-6895; Fax: +1-613-533-6794.

E-mail address: boothc@kgh.kari.net (C.M. Booth).

http://dx.doi.org/10.1016/j.clon.2016.09.018
0936-6555/

the future, as a recent UK phase III trial designed to address this question closed early due to poor accrual [7].

Recent guidelines from the American Society of Clinical Oncology and the National Institute for Health and Care Excellence (NICE) encourage multidisciplinary care in patients with MIBC [8,9]. NICE guidelines from the UK stipulate that all patients with muscle-invasive urothelial bladder cancer for whom radical therapy is suitable should be offered a choice of radical cystectomy or radiotherapy with a radiosensitiser. The guideline further states that patient's choice should be based on a full discussion between the patient and the urologist to carry out the radical cystectomy, as well as a clinical oncologist for evaluation and discussion of radiotherapeutic options.

Adjusting for case mix, in routine practice, survival after radical radiotherapy is comparable with survival after cystectomy [10–13]. Despite this, rates of use of radiotherapy are low and getting lower. We have recently shown that between 1994 and 2008 the proportional utilisation of radiotherapy for bladder cancer in routine practice has decreased [10]. Low rates of bladder-sparing radiotherapy may reflect patient preference and/or a pre-emptive decision by the urologist not to present the radiotherapy option, or refer the patient to radiation oncologists.

The extent to which low utilisation is driven by lack of referral to radiation oncology is unclear. To our knowledge, there are no studies to date describing referral patterns to radiation oncology among patients with MIBC treated in the general population. To address this gap in the literature we undertook a population-based study of patients with MIBC in Ontario to describe radiation oncology referral patterns and to identify factors associated with radiation oncology referral. The first objective of this study was to determine the proportion of patients who were referred to a radiation oncologist before undergoing radical surgery or radiotherapy, and to explore factors associated with radiation oncology referral. In addition to bladder-sparing radical therapy, postoperative radiotherapy may be indicated in select patients who are at high risk of local recurrence. The second objective was therefore to determine the proportion of patients who are referred to a radiation oncologist after cystectomy and to explore factors associated with postoperative referral.

Materials and Methods

Study Design and Population

This was a population-based, retrospective cohort study to describe referral patterns to radiation oncology among all patients with bladder cancer treated with radical surgery or radiotherapy in the Canadian province of Ontario. Ontario has a population of about 13 million people and a single-payer universal health insurance programme. All incident cases of bladder cancer in Ontario with transitional cell, adenocarcinoma and squamous cell histology who underwent cystectomy or radical radiotherapy in 1994–2008 were included. The study population was classified into three temporal periods: 1994–1998, 1999–2003, 2004–2008.

Data Sources

The Ontario Cancer Registry (OCR) is a passive, population-based cancer registry that captures diagnostic and demographic information on at least 98% of all incident cases of cancer in the province of Ontario [14]. The OCR does not compile information about extent of disease or treatment. Surgical pathology reports were obtained from the OCR and reviewed by a team of data abstractors. Abstracted information included T stage, lymph node status, evidence of lymphovascular invasion and margin status. Pathological information was only available for those cases treated with cystectomy.

A variety of electronic administrative health databases were linked to the OCR. Indicators of the socioeconomic status of the community in which patients resided at diagnosis were linked to the OCR from Statistics Canada, as described previously [15]. Records of hospitalisation from the Canadian Institute for Health Information provided information about surgical interventions; these records are known to be consistent and complete [16]. The clinical databases of Ontario's comprehensive cancer centres provided records of radiotherapy and chemotherapy. These centres are the only providers of radiotherapy in the province and the electronic radiotherapy records are known to be 95% complete and 99% accurate with respect total dose, number of fractions, date of therapy, body region irradiated and treatment intent [17]. Provincial physician billing records and treatment records from regional cancer centres were used to identify radiotherapy referrals.

Exposures and Outcomes

Comorbidity was classified using the Charlson Index modified for administrative data based on all non-cancer diagnoses recorded during any hospital admission within 5 years before surgery [18]. The catchment areas of Ontario's regional cancer centres were established based on observed referral patterns, as described previously [19]. Each case in the study population was assigned a surgeon volume based on the mean number of annual cases over a 5 year study period, as previously reported [20]. Cases were divided into quartiles by surgeon volume index.

Cases treated with radical radiotherapy were identified from the radiotherapy treatment records of Ontario's regional cancer centres, which are the only providers of radiotherapy in the province. Cases treated to the bladder or pelvis with curative intent were included, as were those with missing intent who were treated with <250 cGy/fraction. Cases treated with surgery and radiotherapy were further classified based on the sequence and timing of both modalities: surgical case with preoperative radiotherapy (radiotherapy first with surgery <16 weeks after completing radiotherapy); radiotherapy case with salvage surgery (radiotherapy first with surgery >16 weeks from the end date of radiotherapy); surgical case with postoperative radiotherapy (surgery first with radiotherapy starting within <16 weeks); surgical case with salvage

Please cite this article in press as: Quirt JS, et al., Patterns of Referral to Radiation Oncology among Patients with Bladder Cancer: a Population-based Study, Clinical Oncology (2016), http://dx.doi.org/10.1016/j.clon.2016.09.018