Clinical Oncology xxx (2017) 1–10

Contents lists available at ScienceDirect

Clinical Oncology

journal homepage: www.clinicaloncologyonline.net

Original Article

Variation in Radiotherapy Referral and Treatment for High-risk Pathological Features after Radical Prostatectomy: Results from a Population-based Study

C.J. Jin *†, T.P. Hanna *‡, E.F. Cook †, Q. Miao ‡, M.D. Brundage *‡

* *Department of Oncology, Cancer Center of Southeastern Ontario at Kingston General Hospital, Queen's University, Kingston, Ontario, Canada*
† *Department of Epidemiology, Harvard T.H. Chan School of Public Health, Boston, Massachusetts, USA*
‡ *Division of Cancer Care and Epidemiology, Queen's University Cancer Research Institute, Kingston, Ontario, Canada*

Received 14 June 2017; received in revised form 21 September 2017; accepted 25 September 2017

Abstract

Aims: Guidelines recommend the discussion of adjuvant radiotherapy post-prostatectomy for prostate cancer patients with high-risk pathology to consider all of their treatment options. We determine whether patterns of radiotherapy referral and treatment post-prostatectomy reflect guideline-based use in a contemporary prostatectomy cohort.
Materials and methods: Electronic treatment records were linked to Ontario's cancer registry. Multivariable regression was used to evaluate clinical and health systems factors associated with referral and the use of adjuvant radiotherapy within 6 months post-prostatectomy.
Results: Among 2663 patients treated with prostatectomy between 1 January 2012 and 30 November 2012, 1261 (47%) were found to have adverse pathology and 492 were referred to radiation oncology ≤6 months post-prostatectomy, of whom 51% received adjuvant radiotherapy. Multivariable analysis showed that patients were more likely to be referred to radiation oncology from a low-volume surgical facility (≤50 versus >50 radical prostatectomy cases, odds ratio 2.50 [1.80–3.48]), if they lived farther from a radiotherapy centre (>50 km versus <10 km, odds ratio 1.73 [1.22–2.46]), if they were seen by radiation oncology preoperatively (odds ratio 1.95 [1.51–2.52]), or if they had adverse pathology: high T-category (pT3b/T4 versus pT2, odds ratio 17.87 [12.14–26.30]; pT3a versus pT2, odds ratio 5.24 [3.95–6.97]), positive margins (non-apex positive versus negative, odds ratio 4.20 [3.19–5.53]; apex only positive versus negative, odds ratio 2.60 [1.71–3.94]) and high Gleason score (8–10 versus ≤6, odds ratio 11.32 [5.37–23.84]; 7 versus ≤6, odds ratio 4.18 [2.16–8.10]). Wide geographic variation in radiotherapy referral rates persisted (range 6–66%; $P < 0.0001$). After radiotherapy referral, only high T-category (pT3b/T4 versus pT2, odds ratio 5.37 [3.01–9.60]; pT3a versus pT2, odds ratio 2.72 [1.59–4.65]) and non-apex positive margins (odds ratio 2.81 [1.86–4.23]) remained significantly predictive of treatment.
Conclusions: Variations in referral for a discussion of radiotherapy post-prostatectomy are not mainly explained by patient characteristics. After seeing radiation oncology, treatment decisions correlated most strongly with pathological findings. Understanding the reasons for the tremendous non-clinical variations in care is needed to ensure access to potentially curative radiotherapy post-prostatectomy for high-risk prostate cancer patients.

Key words: Access and evaluation; health care quality; physician's practice patterns; prostatectomy; prostatic neoplasms; radiation oncology

Introduction

The decision on many cancer treatments is challenging and value-laden, and patients need information to meaningfully participate in decisions about their health care. A survey of Ontario cancer patients identified the need for information as one of the greatest problems they encountered [1]. Particularly for men with a diagnosis of high-risk prostate cancer, recent trends show an increase in the use of radical prostatectomy [2]. For patients found to have high-risk pathological features, including pT3 disease and/or positive margins, 60–70% will develop biochemical

Author for correspondence: M.D. Brundage, Department of Oncology, Cancer Centre of Southeastern Ontario at Kingston General Hospital, Burr 2 Kingston General Hospital, 25 King Street W, Kingston, Ontario, K7L 5P9 Canada. Tel: +1-613-544-2631 ext 4144; Fax: +1-613-548-1355.
E-mail address: michael.brundage@krcc.on.ca (M.D. Brundage).

https://doi.org/10.1016/j.clon.2017.10.009
0936-6555/

recurrence and face a complex decision with respect to the timing and type of management post-radical prostatectomy [3–6].

Adjuvant radiotherapy (ART) has been shown to reduce the risk of biochemical recurrence and, in some cases, improve survival for men with high-risk pathology post-radical prostatectomy in three large randomised trials [3,6,7]. However, controversy surrounding the trade-offs with toxicity exists, and delayed referral for salvage radiotherapy is under evaluation as an alternative strategy [8–11].

Considering these factors, patients with high-risk pathological features, specifically pT3 disease and/or positive margins, are recommended by guidelines to have an informed discussion of the potential benefits and risks of ART as compared with alternatives [12–17]. The American Urological Association (AUA) and American Society for Radiation Oncology (ASTRO) recommend a patient-centred, multidisciplinary discussion and guidelines from the Genitourinary Radiation Oncologists of Canada (GUROC) and Cancer Care Ontario (CCO) specifically recommend radiation oncologist consultation for this discussion [13,14,17].

Despite the need for ART discussion raised by international consensus guidelines, accumulating epidemiological data suggest that ART rates remain low, and are correlated with institutional characteristics, including surgical volume and academic versus non-academic affiliation [18–24]. The considerable geographic variation in the use of ART raises the question of whether patients are provided with equal opportunities in getting the information that they need to make fully informed decisions on curative treatments. This has important implications for principles of patient autonomy and justice [25]. Although clinical practice guidelines are systematically developed and are intended to streamline care and reduce unwarranted variation, the dissemination of evidence and guidelines often has variable effects on practice [26].

Management issues surrounding adverse pathology post-radical prostatectomy will affect a large number of North Americans this year. Past analyses of processes of care, including referral to radiation oncology, leading to radiotherapy use in prostate cancer, are limited. Given that in the Canadian setting early radiation oncology referral is clearly recommended for the discussion of treatment options in practice guidelines, we set out to evaluate health system performance regarding radiotherapy referral and subsequent treatment post-prostatectomy. We sought to investigate medical and non-medical factors associated with practice patterns in a large, population-based study, and the degree to which practice patterns reflected guideline-recommended access to patient-centred care.

Given the lack of definitive comparison between adjuvant versus salvage radiotherapy, as well as the competing time pressures and burden of disclosure faced by urologists, we hypothesised that sizeable variations in referral rates to radiation oncology and subsequent ART use would exist and that non-clinical factors would strongly predict access to a radiotherapy opinion.

Materials and Methods

Study Design

This retrospective cohort study included all prostate cancer patients treated with radical prostatectomy between 1 January 2012 and 30 November 2012 in Ontario.

Data Sources and Linkage

Ontario has a population of 13.8 million people, and a publicly funded universal health insurance plan. The provincial cancer agency, CCO, is responsible for co-ordinating provincial cancer centres, which are the only providers of radiotherapy. Radical prostatectomy is carried out in a wider range of public hospitals.

The Ontario Cancer Registry is a population-based registry operated by CCO that collects demographic and clinical information on >95% of cancer cases diagnosed in Ontario [27]. Records on incident prostate cancer cases were used. Registry data were linked to hospital separation data identifying radical prostatectomy cases (Canadian Institute of Health Information); pathology data (uniformly electronically compiled by CCO since 2012); radiotherapy visit and treatment data (routinely electronically compiled by CCO from each radiotherapy centre); and for socioeconomic status, neighbourhood median income quintile data (Statistics Canada). Values in the results were suppressed for groups of less than five patients, as per privacy agreements with CCO.

Definitions of Radiation Oncology Consultation and Radiotherapy Use

The primary outcomes of this study were whether patients were seen by radiation oncology early for consideration of ART, and receipt of ART. We defined radiation oncology consultation post-radical prostatectomy as the first radiation oncology visit ≤6 months post-radical prostatectomy. ART was defined as curative-intent radiotherapy initiation ≤6 months, as previously described [9,17,28]. Pathology data were routinely electronically compiled since 2012 and radiotherapy records were complete to 30 May 2013, allowing us to report on radiotherapy use ≤6 months post-radical prostatectomy for cases with an index surgery date from 1 January 2012 up to 30 November 2012.

Definitions of Explanatory Variables

Patients were considered to have received a preoperative radiation oncology consultation if they were seen within 12 months prior to radical prostatectomy [29].

Surgical margin positive cases were stratified by site of positive margin to account for vague boundaries at the prostatic apex. When tumour was found at the inked apical margin and margin-confined elsewhere, margins were classified as ‘apex positive only’. Other cases were categorised as ‘at least 1 non-apex margin positive’.

Please cite this article in press as: Jin CJ, et al., Variation in Radiotherapy Referral and Treatment for High-risk Pathological Features after Radical Prostatectomy: Results from a Population-based Study, Clinical Oncology (2017), https://doi.org/10.1016/j.clon.2017.10.009