Is modern external beam radiotherapy with androgen deprivation therapy still a viable alternative for prostate cancer in an era of robotic surgery and brachytherapy: A comparison of Australian series

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Introduction

There have been significant improvements in localised prostate cancer treatments, with advances in surgery, brachytherapy and external beam radiotherapy (EBRT). In Australia, most of the recent published series focus on surgical advances (e.g. robotic-assisted radical prostatectomy or RARP) and brachytherapy. There are few reports evaluating the results of modern EBRT. Modern EBRT has improved markedly with the now common use of dose-escalation (DE), MRI-CT fusion, daily image guidance with fiducial markers (IG) and intensity-modulated radiotherapy (IMRT). In addition, our understanding of the timing and duration of treatment has advanced, with the use of androgen deprivation therapy (ADT) to downstage disease prior to radiotherapy. This has led to improved outcomes in terms of disease control and preservation of function.

Methods

Five-year actuarial biochemical disease-free survival (bDFS), metastasis-free survival (MFS) and prostate cancer-specific survival (PCaSS) were calculated for 675 patients treated with DE-IG-IMRT and androgen deprivation therapy (ADT). Patients had intermediate-risk (IR) and high-risk (HR) disease. A search was conducted identifying Australian reports from 2005 onwards of IR and HR patients treated with surgery or brachytherapy, reporting actuarial outcomes at 3 years or later.

Results

With a median follow-up of 59 months, our 5-year bDFS was 93.3% overall: 95.5% for IR and 91.3% for HR disease. MFS was 96.9% overall (99.0% IR, 94.9% HR), and PCaSS was 98.8% overall (100% IR, 97.7% HR). Prevalence of Grade 2 genitourinary and gastrointestinal toxicity at 5 years was 1.3% and 1.6%, with 0.3% Grade 3 genitourinary toxicity and no Grade 3 gastrointestinal toxicity. Eight reports of brachytherapy and surgery were identified. The HDR brachytherapy series’ median 5-year bDFS was 82.5%, MFS 90.0% and PCaSS 97.9%. One surgical series reported 5-year bDFS of 65.5% for HR patients. One LDR series reported 5-year bDFS of 85% for IR patients.

Conclusions

Modern EBRT is at least as effective as modern Australian surgical and brachytherapy techniques. All patients considering treatment for localised prostate cancer should be referred to a radiation oncologist to discuss EBRT as an equivalent option.

Key words: brachytherapy; external beam radiotherapy; intensity-modulated radiotherapy prostate cancer; radical prostatectomy.

Abstract

Introduction: We compare the results of modern external-beam radiotherapy (EBRT), using combined androgen deprivation and dose-escalated intensity-modulated radiotherapy with MRI-CT fusion and daily image guidance with fiducial markers (DE-IG-IMRT), with recently published Australian series of brachytherapy and surgery.

Methods: Five-year actuarial biochemical disease-free survival (bDFS), metastasis-free survival (MFS) and prostate cancer-specific survival (PCaSS) were calculated for 675 patients treated with DE-IG-IMRT and androgen deprivation therapy (ADT). Patients had intermediate-risk (IR) and high-risk (HR) disease. A search was conducted identifying Australian reports from 2005 onwards of IR and HR patients treated with surgery or brachytherapy, reporting actuarial outcomes at 3 years or later.

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Conclusions: Modern EBRT is at least as effective as modern Australian surgical and brachytherapy techniques. All patients considering treatment for localised prostate cancer should be referred to a radiation oncologist to discuss EBRT as an equivalent option.

Key words: brachytherapy; external beam radiotherapy; intensity-modulated radiotherapy prostate cancer; radical prostatectomy.
androgen deprivation therapy (ADT) in combination with EBRT has improved, with multiple studies demonstrating the additional benefits of the combination of ADT and EBRT. These advances have improved the results of EBRT, and are reflected in the national Australian EviQ radiotherapy guidelines (www.EviQ.org.au), which recommend the use of DE-IG-IMRT with MRI-CT fusion and daily image guidance using fiducial markers, combined with ADT for intermediate-risk (IR) and high-risk (HR) localised prostate cancer.

However, the lack of contemporary Australian series utilising modern EBRT techniques could lead to a perception that EBRT is inferior to modern surgery or brachytherapy, a view contradicting national guidelines and patient information booklets. Indeed, the present authors occasionally receive correspondence from other specialists regarding patients with localised prostate cancer categorically stating the superior efficacy results at 3 years or later.

The purpose of our report is to evaluate the long-term efficacy of modern EBRT in treating IR and HR disease, utilising a combination of ADT and DE-IG-IMRT, and to compare this to contemporary Australian series of surgery and brachytherapy.

Methods

A Medline search was conducted (1 December 2013) using the following Boolean search: (prostate AND Australia) AND (radiotherapy OR brachytherapy OR HDR OR LDR OR surgery OR prostatectomy), limiting the search to studies published during or after 2005. In addition, ‘The Open Prostate Cancer Journal’, a non-Medline indexed online open-source peer-reviewed journal, was also searched for relevant articles. Australian surgical and brachytherapy series including IR and/or HR prostate cancer patients were included if they reported actuarial efficacy results at 3 years or later.

Following institutional ethics approval (North Coast New South Wales Human Research Ethics Committee, Reference Number QA 101), the electronic medical record (EMR) of our institution (Mosaïq, Elekta, Crawley, UK) was interrogated to identify all patients with prostate cancer treated with our standard protocol of definitive DE-IG-IMRT and ADT. Exclusion criteria included patients who were post-prostatectomy, node-positive, metastatic, with histology other than adenocarcinoma, did not receive ADT or treated from 2011 onwards. Staging CT of the abdomen/pelvis and bone scan were performed on all patients with HR disease.

All patients received ADT using leuprorelin or goserelin acetate monotherapy, with 3–6 months of neoadjuvant/concurrent ADT, and patients with HR disease receiving adjuvant ADT for a planned 2 years. Patients underwent trans-rectal ultrasound-guided insertion of gold fiducial markers followed by MRI/CT fusion (as previously reported), unless contraindicated. Patients were treated on an institutional ‘Bowel and Bladder Protocol’, involving low-residue diet, aperients and pretreatment oral fluid regimen to achieve a comfortably full bladder and empty rectum. The planning CT scan (2 mm slices) was performed with patients positioned supine and immobilised with ankle stocks. Patients had the proximal 4–8 mm of seminal vesicles (SVs) included in their field. Patients with HR features had distal SVs included to either full dose (if SV positive clinically/on MRI), or to 50 Gy equivalent via simultaneous integrated boost. The median total dose was 78 Gy (range 73.8–81 Gy) in 1.8 to 2.0 Gy fractions. Image guidance utilised either daily online kV portal images (matched to fiducial markers) or with daily cone beam CT (CBCT). Patients without fiducial markers (<1% of all patients) underwent daily CBCT matching to soft tissue and bone. Biochemical failure was classified using the Phoenix definition (PSA nadir + 2 ng/mL), and all patients with biochemical failure were restaged with CT and bone scans, with salvage androgen deprivation initiated when the PSA reached between 10 and 20 ng/mL. Follow-up time was calculated from the date of commencement of ADT as recommended by Denham et al. Toxicity was scored prospectively (real time) by the radiation oncologist or radiation oncology registrar at each consultation, and recorded in the Mosaïq EMR using common toxicity criteria (CTC): toxicity data were available for 94.1% of patients who had reached 5 years post-treatment. Data collection and analysis were performed independently of the treating radiation oncologist (TPS). Kaplan–Meier survival outcomes were calculated using SPSS v20 (IBM Corporation, Armonk, NY, USA). Outcomes between the DE-IG-IMRT cohort and the other Australian series were compared at similar endpoints dictated by the published comparison endpoint. Graph comparisons were performed after standardising the axes.

Results

Current series using DE-IG-IMRT

There were 675 patients treated with DE-IG-IMRT and ADT from 2006 to 2010 (Table 1). An additional 22 patients were excluded due to not receiving ADT. Three hundred and thirty-five (49.6%) patients were IR and 340 (50.4%) were HR. Thirteen of the 675 patients (1.9%) were classified as ‘lost to follow-up’. Median follow-up was 59 months. Actuarial biochemical disease-free survival (bDFS) at 5 years was 93.3% overall, and 95.5% and 91.3% respectively for IR and HR patients. Metastasis-free survival (MFS) was 96.9% overall, 99.0% IR and 94.9% HR. Prostate cancer-specific survival (PCaSS) was 98.8% overall, 100% for IR patients and 97.7% for HR patients.

DE-IG-IMRT treatment was associated with very low toxicity at 5 years. Prevalence of Grade 2 genitourinary (GU) and gastrointestinal (GI) toxicity at 5 years from
treatment were 1.3% and 1.6%, with 0.3% of patients experiencing Grade 3 GU toxicity and no Grade 3 GI toxicity reported.

Comparison

A total of 791 articles were returned by the Medline search, of which 517 were during or after 2005. There were eight contemporary published Australian studies suitable for comparison, with six reporting high-dose rate brachytherapy (HDRB) outcomes,5–10 one reporting open prostatectomy (OP) outcomes5 and one reporting robotic-assisted radical laparoscopic prostatectomy (RALP) outcomes.4 One low-dose rate brachytherapy (LDRB) series was also found in the online journal.11 The surgical series both reported HR prostate patients only. One dose-escalated IMRT study was found; however, it did not report the use of daily image guidance and patients did not appear to have fiducial markers inserted.12 Results of HDRB studies are shown in Table 2 and Figure 1; results of surgical series are shown in Table 3 and Figure 2. Results of the LDRB study are shown in Table 4 and Figure 3.

For the HDRB series, the median reported actuarial 5-year bDFS was 82.5% (range 79.8–85.1%), the MFS was 90% (reported in only one study) and the median PCaSS was 96.5% (range 96.9–96.9%). For the surgical series, only one reported 5-year bDFS,5 which was 66%. Although prostate cancer metastases and deaths did occur in this study, actuarial 5-year MFS and PCaSS were not reported. The LDRB series,11 which contained predominantly low-risk patients, reported overall 5-year bDFS of 91.9%. MFS and PCaSS were not reported. When limited to the comparison of the IR patients, 5-year bDFS as measured from the figures was 85%.

Discussion

Modern EBRT has evolved rapidly due to technological and engineering advances, resulting in higher doses of radiation being delivered more accurately, and lower doses to surrounding normal tissues. This has resulted in higher cure rates with low toxicity. Many centres have embraced modern advances in EBRT, with over 90% of NSW centres using IMRT.22 Despite this high uptake, there has been no published Australian series evaluating the results of DE-IMRT using daily image guidance. A recent study investigating Australian radiation oncologist treatment practices for patients with HR disease23 highlighted the need for Australian perspectives in light of the varied practices throughout the country. In addition, there is a distinct lack of published data internationally evaluating the long-term follow-up of patients treated with DE-IG-IMRT combined with ADT, with authors emphasising the ‘critical need’ for more data for this combination.24 The lack of Australian data could conceivably contribute to a perception in Australia that localised prostate cancer is better treated by surgery or brachytherapy, with at least some Australian authors claiming the superiority of HDRB over EBRT.10

Our series of 675 patients with IR and HR prostate cancer treated with DE-IG-IMRT and ADT is one of Australia’s largest contemporary institutional series of patients treated for localised prostate cancer. Other large Australian studies, such as the RADAR study25 and TROG 96.01,26,27 use what would now be considered as outdated radiotherapy techniques. These randomised trials used doses as low as 66 Gy of radiotherapy, without IMRT or daily image guidance. In addition, the mainly HR patients in TROG 96.01 received a maximum of 6 months androgen deprivation. RADAR has not yet published efficacy results; however, TROG 96.01 has published 5-year26 and 10-year27 results. Direct comparison to our series is difficult, given that the TROG 96.01 actuarial 5-year results are only presented in graphical format. However, these graphs show lower PCaSS and higher distant failure rates than in the present series. The reasons for the better results in our series are likely multifactorial, but may be partly due to dose escalation, daily image guidance to reduce geographical miss and the use of longer-term ADT for HR patients. All HR patients in our series received adjuvant ADT, which was used variably in the comparator studies. The use of ADT in the setting of dose escalation is somewhat controversial. There is high-level data supporting its use in IR and HR patients with conventional doses of radiotherapy,28 with conflicting data for its use when dose escalating.24,29–31 However, several international series of dose-escalated EBRT combined with ADT have excellent results, similar to ours.24,31,32 For example, Zapatero et al.’s series of 306 HR patients treated with 78 Gy EBRT combined with ADT reported 89.5% 5-year bDFS.32

<table>
<thead>
<tr>
<th>Parameter</th>
<th>n = 675</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Median (range)</td>
<td></td>
</tr>
<tr>
<td>&lt;71 years</td>
<td>319</td>
</tr>
<tr>
<td>≥71 years</td>
<td>356</td>
</tr>
<tr>
<td>PSA (µg/mL)</td>
<td></td>
</tr>
<tr>
<td>Median (range)</td>
<td></td>
</tr>
<tr>
<td>≤10</td>
<td>310 (45.9%)</td>
</tr>
<tr>
<td>10.1–20</td>
<td>258 (38.2%)</td>
</tr>
<tr>
<td>&gt;20</td>
<td>107 (15.9%)</td>
</tr>
<tr>
<td>T-stage</td>
<td></td>
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<tr>
<td>T1/T2</td>
<td>549 (81.3%)</td>
</tr>
<tr>
<td>T3</td>
<td>126 (18.7%)</td>
</tr>
<tr>
<td>Gleason</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>47 (73%)</td>
</tr>
<tr>
<td>7</td>
<td>379 (56.1%)</td>
</tr>
<tr>
<td>8</td>
<td>135 (20%)</td>
</tr>
<tr>
<td>9</td>
<td>110 (16.3%)</td>
</tr>
<tr>
<td>10</td>
<td>4 (0.6%)</td>
</tr>
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</table>

Table 1. Patient demographics
### Table 2. Comparison between NCCI series and published Australian brachytherapy series

<table>
<thead>
<tr>
<th>Author</th>
<th>Patients</th>
<th>Modality</th>
<th>ADT</th>
<th>Risk groups</th>
<th>Median follow-up (months)</th>
<th>5-year bDFS (Phoenix)</th>
<th>5-year MFS</th>
<th>5-year PCaSS</th>
<th>Grade 3 late toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current NCCI series</td>
<td>675</td>
<td>DE-IG-IMRT</td>
<td>Neo 100%</td>
<td>IR 49.6%</td>
<td>HR 50.4%</td>
<td>Overall 93.3%</td>
<td>96.9%</td>
<td>98.8%</td>
<td>0.3% GU</td>
</tr>
<tr>
<td>Khor et al.[^10]</td>
<td>344</td>
<td>HDR + EBRT</td>
<td>Neo 59%</td>
<td>IR 59%</td>
<td>HR 41%</td>
<td>Overall 79.8%</td>
<td>90.0%</td>
<td>NR</td>
<td>11.8% stricture (GI NR)</td>
</tr>
<tr>
<td>Izard et al.[^7]</td>
<td>253</td>
<td>PDR + EBRT</td>
<td>Neo 100%</td>
<td>LR 15%</td>
<td>IR 49%</td>
<td>Overall 84%</td>
<td>NR</td>
<td>96%</td>
<td>6% GU (RTG 6 year)</td>
</tr>
<tr>
<td>Zwählen et al.[^8]</td>
<td>196</td>
<td>HDR + EBRT</td>
<td>Neo 100%</td>
<td>LR 4.5%</td>
<td>IR 45%</td>
<td>Overall 82.5%</td>
<td>NR</td>
<td>96.9%</td>
<td>0% GI (RTG 5 year)</td>
</tr>
<tr>
<td>Whalley et al.[^9]</td>
<td>101</td>
<td>HDR + EBRT</td>
<td>Neo 95%</td>
<td>IR 65%</td>
<td>HR 36%</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>2% GU (CTCAE 4 years)</td>
</tr>
<tr>
<td>Savdie et al.[^5]</td>
<td>90</td>
<td>HDR + EBRT</td>
<td>Adj 100%</td>
<td>HR 100%</td>
<td>LR and IR R (% NR)</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>&gt;10.3% GU, 0% GI (CTCAE 3 months post RT)</td>
</tr>
<tr>
<td>Barkati et al.[^6]</td>
<td>79</td>
<td>HDR</td>
<td>Neo 9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adj, adjuvant ADT; ADT, androgen deprivation therapy; bDFS, biochemical disease-free survival; DE, dose escalation; EBRT, external beam radiotherapy; GI, gastrointestinal; GU, genitourinary; HR, high risk; IG, image guidance with fiducial markers; IMRT, intensity-modulated radiotherapy; IR, intermediate risk; LR, low risk; MFS, metastasis-free survival; Neo, neoadjuvant ADT; NR, not reported; PCaSS, prostate cancer-specific survival.
It is not possible to determine individual contributions of modern DE-EBRT techniques and ADT to these excellent results, and this is an area requiring further research.

At 5 years, our series of modern EBRT and ADT has results comparing very favourably with modern Australian series of brachytherapy and surgery, although direct statistical comparison is obviously impossible for a number of reasons. Firstly, in the absence of a prospective, randomised study, there is no way to adequately control for bias (e.g. in patient selection) that is inherent in institutional series (with the least favourable patients tending to receive EBRT). Definitions of PSA failure differ between series, but unfortunately harder endpoints, such as MFS and PCaSS, are inconsistently reported. However, even these endpoints are affected by how hard one searches for metastatic failure and how (and whether) failures were treated. In addition, the comparator series measure follow-up from different time points, including the start of treatment and end of radiotherapy. We have elected to use the most accurate time point, the start of treatment, as recommended by Denham et al. in the analysis of TROG 96.01. If measured from the end of radiotherapy, our 5-year bDFS was 92.5% (vs. 93.3%), and differences in survival curve comparisons are barely discernible.

Many of the issues affecting comparisons can only be adequately addressed by prospective randomised trials, and strong conclusions claiming the superiority of one treatment over another should be avoided. Although this seems self-evident, several authors have used the results of non-randomised, retrospective comparisons to claim the superiority of surgery and brachytherapy over other treatments.

One example is the recent non-randomised observational study by Sooriakumaran et al., which has a

Table 3. Comparison of high-risk patients treated with DE-IG-IMRT, open prostatectomy (OP), robotic-assisted laparoscopic radical prostatectomy (RALP)

<table>
<thead>
<tr>
<th>Author</th>
<th>Patients</th>
<th>Technique</th>
<th>Risk group</th>
<th>Median follow-up (months)</th>
<th>5-year bDFS</th>
<th>5-year MFS</th>
<th>5-year PCaSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current NCCI series</td>
<td>340</td>
<td>IG-IMRT + ADT</td>
<td>High risk</td>
<td>59</td>
<td>91.3% (3 years, 95.8%)</td>
<td>94.9% (3 years, 97.3%)</td>
<td>97.7% (3 years, 99.7%)</td>
</tr>
<tr>
<td>Connolly et al.</td>
<td>160</td>
<td>RALP 100%</td>
<td>High risk</td>
<td>26.2</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Savdie et al.</td>
<td>153</td>
<td>OP 100%</td>
<td>High risk</td>
<td>95.3</td>
<td>65.5%</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

Adj, adjuvant; ADT, androgen deprivation therapy; bDFS, biochemical disease-free survival; EBRT, external beam radiotherapy; IG, image guidance with fiducial markers; IMRT, intensity-modulated radiotherapy; MFS, metastasis-free survival; Neo, neoadjuvant; NR, not reported; PCaSS, prostate cancer-specific survival.

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median follow-up of 5.37 years and concludes that there may be a survival benefit for surgery over radiotherapy. This study has been heavily criticised by urologists and radiation oncologists alike due to selection bias putting surgery at an advantage, unbalanced patient groups favouring surgery, outdated radiotherapy techniques, lack of optimal ADT, lack of standardised (or any evaluation of) salvage therapy and the paper containing major errors. Not surprisingly, the comparison has been described as ‘flawed’, and the conclusions as ‘scientifically untenable’. Unfortunately, we are unable to compare our results to this Swedish cohort due to their lack of actuarial reporting.

Another recent comparison attempts a large-scale literature review of PSA outcomes across differing treatments, and again highlights the difficulties of comparative studies. Grimm et al. did not report actuarial 5-year results, instead graphically displayed standard deviation ‘ellipses’ of published results, with no other statistical comparisons. Grimm et al. concludes that brachytherapy (with or without EBRT) is superior to surgery or EBRT alone. However, this paper has also been criticised as it excluded valid studies (e.g. Zapatero et al.’s series), double counted some studies, used erroneous methodology and incorrectly presented data. In addition, the authors have not accounted for selection bias, unbalanced patient groups, differences in staging and salvage therapy, radiotherapy dose, or ADT use. Unsurprisingly, the study has been described as ‘biased’ and failing to ‘provide evidence-based prostate cancer treatment comparisons’. Although it is difficult to directly compare, our 5-year actuarial results appear to be better than Grimm et al.’s reported studies of surgery, brachytherapy and EBRT. Zapatero et al.’s results using DE-EBRT and ADT would also have been superior to these other modalities.

There are several other limitations of our study. As mentioned, not all published series report better endpoints, such as MFS or cancer-specific survival, and certainly this could improve comparisons. Longer-term data, such as 10- and 20-year outcomes, are also required, and this has been lacking for radiotherapy series in general. Survival curves were compared after standardising axes. This may not be as precise as generating comparative curves from raw data; it is, however, a reasonable means of representing published series along with the actuarial outcomes presented in our Tables. Toxicity outcomes are even more difficult to compare across studies due to variations in recording and reporting, and this issue has been noted by others.

With regard to toxicity, although we report physician-reported toxicity, we do not report patient-reported outcomes (although we have previously done so in terms of decision-regret). This limitation is shared by all but one of the comparator studies we identified, and highlights the need for clinicians to address this important aspect of patient care. We also do not report ADT-specific toxicity (although we again have done so previously in terms of ADT-specific decision-regret). Unfortunately, ADT toxicity has not been reported in any of the other studies identified for our comparison despite the use of ADT in all of them.

Although we report low levels of toxicity, we do not believe a comparison with the other studies is valid for several reasons. We report prevalence rates at 5 years,
whereas the other studies variably report prevalence and actuarial rates. The scoring systems used are different, with variation in prospective versus retrospective scoring. It is also likely that variation in scoring will occur depending on who scores toxicity, and this has not been standardised in any study. In our series, toxicity was prospectively scored by either the treating radiation oncologist or registrars. Nonetheless, our toxicity rates are low at 5 years, and are mirrored in the very low levels of decision-regret reported.\(^4\) Decision-regret is a patient-centred outcome reflecting patients’ perceptions of outcomes, including toxicity, quality of life and cure. Only 3.8% of our patients expressed decision-regret, whereas regret for other modalities, such as surgery, have been reported to be as high as 53%.\(^4\)

The low levels of toxicity we report may be due to a number of factors. Image guidance allows reduced margins and superior organ sparing during EBRT. This has been shown to result in lower toxicity, whether utilising DE-IG-IMRT\(^4\) or three-dimensional conformal radiotherapy.\(^4\) In addition, our patients received planning MRI, with MRI-CT fusion to aid volume definition.\(^2\) This has been shown to reduce the volume of the clinical target volume by up to 31%, reducing rectal dose and presumably reducing toxicity.\(^4\) Furthermore, the use of ADT allows cytoreduction of prostatic volume (reducing treatment volume), with ADT itself postulated to provide protective effects from radiation toxicity.\(^4\)\(^5\)\(^6\) We also have a policy of optimising urinary and bowel function prior to radiotherapy through urology and gastroenterology review if baseline symptoms are present. This ensures that functionality is maximised prior to treatment, with any symptoms appearing after radiotherapy addressed and managed as soon as detected.\(^4\) We have found that stringent investigation of presumed late radiotherapy toxicity often determines that radiotherapy is not the cause of symptoms.\(^4\) The temporality of radiation toxicity reporting may also be a significant factor, with late radiation toxicity frequently reducing with longer follow-up.\(^8\)\(^9\)\(^10\) The fact that all of the late toxicities in our cohort were only reported at 5 years post-radiotherapy may also contribute to the excellent toxicity rates seen. The TROG 03.04 RADAR study of radiotherapy and ADT similarly supports the reduction in radiation-related toxicity with longer follow-up.\(^2\) Prevalence rates of urinary toxicity were low in their study, with 2.6% of patients experiencing Grade 2 toxicity at 18 months, and reducing to 1.7% at 36 months. Rectal toxicity levels were higher, with greater than Grade 1 dysfunction in 15.4% at end of radiotherapy and 18.1% at 36 months. That study was performed prior to widespread use of image guidance, MRI-CT fusion and IMRT, which may account for some of the differences between series.

Despite the limitations, it is clear that modern EBRT techniques using DE, MRI-CT fusion, daily IG with fiducial markers and IMRT, combined with ADT, offers an excellent alternative to surgery and brachytherapy. Ongoing developments such as volumetric arc therapy (VMAT) and intra-fraction motion compensation may further improve results. National guidelines\(^1\) and patient-information booklets\(^1\) are still valid when discussing EBRT as an equivalent option for localised prostate cancer. Due to the rapid engineering and technological advances underpinning EBRT, the physician best able to discuss modern EBRT is a radiation oncologist. This is consistent with the view expressed by the Cancer Council Australia that ‘different specialists are better able to explain their own treatments’.\(^1\) It seems essential that all patients with localised prostate cancer should be referred to a radiation oncologist.

**Conclusion**

Modern DE-IG-IMRT and ADT offer clinical outcomes as efficacious as alternative treatment modalities, and should be discussed with all patients considering definitive treatment options for localised prostate cancer.

**References**


