

# A comparative costs analysis of brachytherapy and Radical Retropubic Prostatectomy therapies for clinically localized prostate cancer

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**Objectives:** The aim of this study is to perform a comparative costs analysis of brachytherapy (BT) and radical retropubic prostatectomy (RRP) for clinically localized prostate cancer and to shed light on the difficulties of comparing their relative economic effectiveness.

**Methods:** A systematic literature review of costing studies available in the Medline, Embase, DARE, and INAHTA databases.

**Results:** There is a lack of homogeneity among published studies in this field. Differences in the reported costs are related to different environments in which the two techniques (BT and RRP) are applied, and in particular due to the use of different methodology, cost items included, time frames, and different price levels in different settings.

**Conclusion:** Published studies of costing data of BT and RRP do not provide clear-cut evidence for a conclusion about which treatment may be more effective from an economic point of view.

**Keywords:** Comparative costs analysis, Prostate cancer

Prostate cancer is a leading cause of cancer deaths among men, second only after lung cancer (3;6), and the cost burden of prostate cancer is high (3;6). The current therapeutic options for clinically localized (T1–T2 stage) prostate cancer include, among radical prostatectomy techniques, radical retropubic prostatectomy (RRP)—the surgical treat-

ment modality of proven efficacy granted with level 1 evidence (4;8), three-dimensional conformal radiotherapy (3DCRT) and brachytherapy (BT)—based on the transrectal ultrasound-guided transperineal implantation of permanent radioactive sources (commonly called “seeds”) evaluated through a computed tomography-based system for

**Table 1.** Average Cost, Relative Average Cost, Difference, Ratio (Current Average Cost Adjusted for U.S. Currency)

References	RRP	BT	Relative average Cost %	Difference between BT and RRP	Ratio BT/RRP
Kohan (1999) (17)	\$13,885.99	\$13,904.57	0	\$18.58	1.00
Wagner (1999) (22)	\$15,097.00	\$21,025.00	39	\$5,928.00	1.39
Ciezki (2000) (9)	Not actual dollar amounts	Not actual dollar amounts			1.85 <sup>a</sup> –2.05 <sup>b</sup>
Brandeis (2000) (5)	\$19,019.00	\$15,301.00	–20	–\$3,718.00	0.80
Alexianu (2000) (1)	\$27,100.00	\$16,200.00	–40	–\$10,900.00	0.60
Penson (2001) (20)	\$7,320.00	\$7,430.00	2	\$110.00	1.02
Makhlouf <sup>c</sup> (2002) (18)	\$7,476.00	\$12,209.00	63	\$4,733.00	1.63
Makhlouf <sup>d</sup> (2002) (18)	\$22,664.00	\$26,321.00	16	\$3,657.00	1.16
Buron <sup>e</sup> (2007) (7)	€14,354.00	€15,068.00		€714.00	
	\$12,650.18 <sup>f</sup>	\$13,279.43 <sup>f</sup>	5	\$629.25	1.05

<sup>a</sup>BT with planning ultrasound performed in the office setting before implantation.

<sup>b</sup>BT with planning ultrasound performed in the operating room at the time implantation.

<sup>c</sup>Direct costs.

<sup>d</sup>Charge.

<sup>e</sup>Euros value 2001.

<sup>f</sup>The values in dollar are obtained adjusting for an exchange rate of \$0.8813 per €.

RRP, radical retropubic prostatectomy; BT, brachytherapy.

postimplantation quality. Surgical treatments and 3DCRT are associated with injuries on adjacent tissue, whereas BT seems to be affected by less side effects when compared with other treatments: this suggests that many patients may find BT more attractive because it also is as equally effective (19). High-intensity focused ultrasound data are not yet available in terms of long-term follow-up (16); the same holds true for the therapeutic option commonly known as “watchful waiting” (grade B recommendation) (14). At present, there are no published trials that directly compare long-term survivals after the various treatments of clinically localized disease, leaving the question of survival benefit unanswered (7).

Systematic reviews of the best available evidence (10;15) claim that efficacy and complications affect the choice of treatment. Our review compares RRP with BT, a choice often preferred by patients for reasons illustrated by Norderhaug et al. (19).

This study is a part research series in Health Technology Assessment field developed by the Department of Public Health and San Giovanni Battista University Hospital (Turin, Italy), which recently focused on economic evaluations of available treatments for early prostate cancer. An analysis of surgical techniques has just been concluded (13); hence, the aim of our study is carrying out a comparative costs analysis of BT and RRP therapies for clinically localized prostate cancer to shed light on the difficulties that analysts face in comparing these treatments and their relative economic effectiveness.

## MATERIALS AND METHODS

A literature search was performed on studies available in the Medline (2), Embase, DARE, and INAHTA databases, using

the terms (MeSH or text search according to the database) “prostatectomy” and “costs”, “costs effective”, “cost benefit analysis”, “economic evaluation”. The detailed search procedure is available with the lead author. English, French, and Italian language references were included. Articles that met the following criteria were included in the analysis: published studies that focus on comparative cost analyses of RRP and BT. Excluded were transurethral resection of prostate and benign prostatic hyperplasia. Of ninety-one articles, only eight met the criteria for the analysis, and these studies were reviewed. Our analysis is based on the following data: (i) current average cost adjusted to U.S. currency and for inflation (base year 2002, that is, the last year used in the published articles to estimate costs) and for exchange rates (12;21); (ii) ratio of average cost of BT and RRP; (iii) difference between BT and RRP average costs; and (iv) relative average cost calculated as the difference between BT and RRP average costs over RRP average costs.

To verify the comparability among estimated BT and RRP average costs, we considered the following information as well: (i) reference period (preoperative, operative, and postoperative period); (ii) whether the cost estimation is based on direct costs or charges; and (iii) breakdown of direct costs or charges into different cost items.

## RESULTS

We reviewed eight relevant published studies that focus on a comparative costs analysis between RRP and BT technique: seven of them compare BT with RRP technique, one of which compare RRP versus BT including adjuvant external beam radiotherapy. In summary (Table 1): (i) Kohan, Penson, and Buron papers suggest the same cost for RRP and BT, (ii)

**Table 2.** Average Cost Adjusted for Inflation (Base Year 2002)

References	RRP	BT
Kohan (1999) (17)	\$14,996.30	\$15,016.37
Wagner (1999) (22)	\$16,304.14	\$22,706.14
Ciezki (2000) (9)	Not actual dollar amounts	Not actual dollar amounts
Brandeis (2000) (5)	\$19,864.36	\$15,981.10
Alexianu (2000) (1)	\$28,304.54	\$16,920.06
Penson (2001) (20)	\$7,437.12	\$7,548.88
Makhlouf <sup>a</sup> (2002) (18)	\$7,476.00	\$12,209.00
Makhlouf <sup>b</sup> (2002) (18)	\$22,664.00	\$26,321.00
Buron (2007) (7)	\$12,852.58	\$13,491.90

<sup>a</sup>Direct costs.<sup>b</sup>Charge.

Wagner found BT to be the more expensive option, and (iii) Makhlouf found BT to be more costly than RRP with a direct cost of 63 percent over RRP average cost, and 16 percent over RRP average cost when average direct cost is based on charges. The difference between RRP and BT average costs is more than \$3,600. Ciezki reaches the same conclusion; however, the author has used two different samples: Group 1 (BT with ultrasound performed in the office setting before implantation) and Group 2 (BT with ultrasound performed in the operating room at the time of the implantation of the seeds). For the first sample (Group 1) the relative average cost is around 85 percent over RRP average cost and for the second (Group 2) around 105 percent over RRP average cost.

Brandeis and Alexianu found BT to be less costly than RRP with a relative average cost around 20 percent over RRP average cost and around 40 percent over RRP average cost, respectively.

Table 2 shows that the average cost of RRP fluctuates between \$7,437.12 and \$28,304.54, and the average cost for BT varies from \$ 7,548.88 to \$ 26,321.00. The studies have all been performed during different periods of time and some

refer to preoperative and operative costs only, while others include costs during postoperative follow-up periods.

Three studies measure BT ad RRP direct costs (1;7;9), whereas two studies, instead of measuring direct costs, use charges (5;22). Two studies use charges based on fee schedule (17;20); finally, one author estimates average costs using at the same time charges and direct costs (18).

Two studies only, among the eight analyzed, provided a breakdown into different cost items of average costs or charges (see Table 3).

## DISCUSSION

Although the use of brachytherapy is growing in popularity, radical prostatectomy remains one of the most common treatments for localized prostate cancer. Because the impact of treatment on survival is still a matter of much debate and there is no clinical consensus in favor of one treatment to the others, cost factors become more important in treatment decision. In our study, we have reviewed the methods and data used in costing studies of the BT and RRP techniques. Our findings show there is a lack of homogeneity among published studies in the field. Differences in the estimated costs are related to different environments in which the two techniques (BT and RRP) are applied (i.e., provider/hospital characteristics such as hospital size or organizational structure, surgeon experience in treatment of prostate cancer, clinical characteristics, geographic region, and so on, may affect treatment costs).

The lack of homogeneity is due in particular to the use of different methodology in evaluating costs, different data, different cost items included, and different time frames.

No conclusion may be made about the relative cost of the two treatments used for early-stage prostate cancer based on this review. The factors mentioned above about different methodology contribute to this.

Another problem concerns the lack of detailed costs information (i.e., breakdown, for instance, anesthesia,

**Table 3.** Reference Period (Preoperative, Operative, and Postoperative Period), Whether the Cost Estimation Is Based on Direct Costs or Charges, and Breakdown of Direct Costs or Charges

References	Time interval			Data type	Breakdown	
	Preoperative	Operative	Postoperative (follow-up)		Yes	No
Kohan (1999) (17)	×	×	×	Follow-up 1 year	Charges estimated on reimbursement fee schedules	×
Wagner (1999) (22)	×	×			Charges	×
Ciezki (2000) (9)	×	×			Costs	×
Brandeis (2000) (5)	×	×	×	Follow-up 8 months	Charges	×
Alexianu (2000) (1)	×	×			Costs	×
Penson (2001) (20)	×	×			Charges estimated on reimbursement fee schedules	×
Makhlouf (2002) (18)	×	×	×	Follow-up 30 days	Costs or charges	×
Buron (2007) (7)	×	×	×	Follow-up 2 year	Costs	×

laboratory medicine, medicine, pharmacy, nursing, radiology, operating room, surgical supplies, recovery room, and so on). Table 3 shows that Wagner et al. (22) and Makhlouf et al. (18) only, have provided a breakdown into different cost items. Some studies do not include detailed costs information, for instance Brandeis et al. and Ciezki et al. (5;9); others provide aggregate cost information only (1;7;17;20).

More homogenous costing studies are needed to contribute to the question of which treatment is less costly as a basis for a true cost-effectiveness analysis of BT versus RRP (11).

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