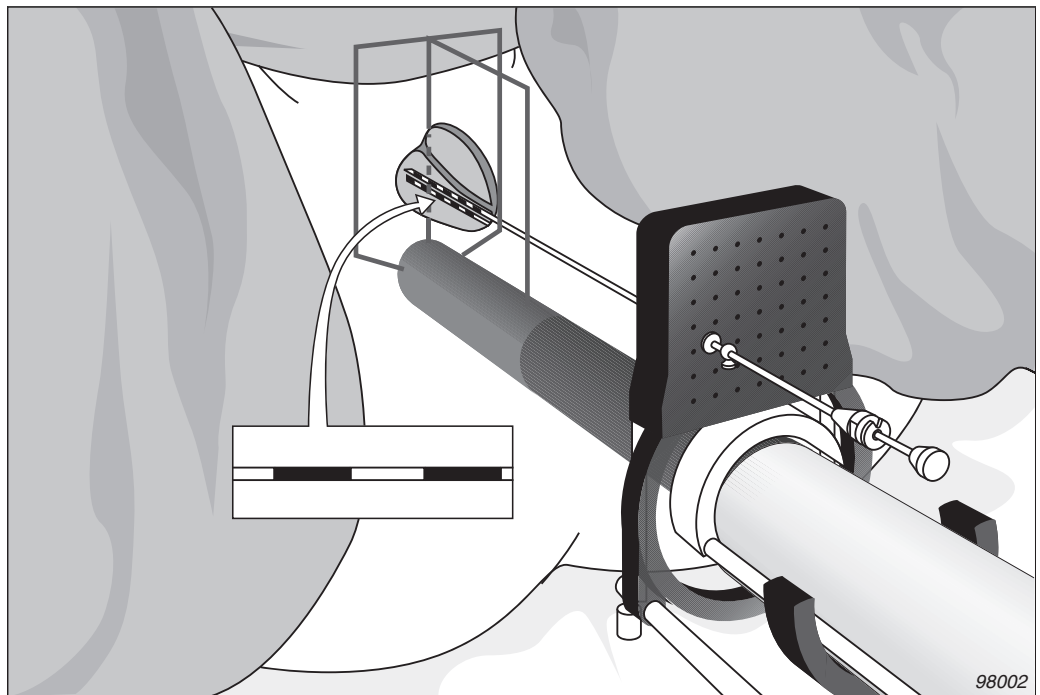


Transperineal radioactive seed implantation

 Application Note



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Transperineal radioactive seed implantation guided by transrectal biplane ultrasound

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Prostate cancer is responsible for a large proportion of male cancer deaths. The optimum treatment for early stage organ-confined tumors remains controversial. Ultimately, the goals of any form of localized treatment should be to obtain local disease control and to minimize the risk of distant metastases. At the same time, quality of life is an important consideration, and any treatment should aim to produce minimal damage to surrounding healthy tissue in the pelvis.

In recent years there has been a growing interest in various forms of imaging-guided ablative techniques for the treatment of organ-confined prostate cancer. Transperineal radioactive seed implantation (Brachytherapy) has emerged as a relatively low-cost, yet effective treatment, with low morbidity and good patient tolerance^{1,2}. Transrectal ultrasound scanning is used to guide seed placement within the prostate gland; and the ability of transducers to image in both transverse and sagittal planes contributes to the accuracy of this technique.

POSITION OF PATIENT AND EQUIPMENT

B-K Medical's transrectal biplane brachytherapy probe (8658) is specifically designed for transrectal prostate imaging and ultrasound-guided prostate interventions.

With the patient in the dorsal lithotomy position, the transducer is mounted in a stepping unit and positioned in the rectum. The transducer is compatible with a range of leading manufacturers stepping units. In this way, the prostate can be systematically scanned from base to apex. A special transducer cradle enables rotation of the transducer about its sagittal axis.

A metal template (Fig.1) is mounted on the stepping unit and placed over the perineum. This template contains a grid of 169 (13 x 13) holes through which the needles are inserted. The scanner software projects an on-screen matrix over the ultrasound image that corresponds to this template (Fig.3). The path of the needles into the prostate can be monitored in both sagittal and transverse planes.

The B-K Medical series of ultrasound scanners have a number of key features that make them ideal for prostate brachytherapy techniques. Their advanced software permit accurate calculation of the prostatic volume, and delineation of the prostate outline relative to the on-screen matrix grid that will guide needle placement into the gland.



Figure 1. Transducer 8658 mounted in an Accuseed™ Stepping Unit with template in place.

EXAMINATION TECHNIQUE

Prostate brachytherapy can be performed as either a one or two-stage technique.

Volume studies

Initially, a prostate volume study is performed to assess the gland. This is done with the patient in the same dorsal lithotomy position that will subsequently be used for the prostate implant itself. Digital examination of the patient's rectum should always be performed prior to insertion of the transducer. The patient may require a small cleansing enema prior to the procedure.

The prostate volume study provides an accurate measurement of gland volume and outline. It enables the radiation oncologist to plan the radiation dose and the distribution of seeds within the prostate. The transducer is covered with a condom containing a small amount of ultrasound gel and is secured in the stepping unit.

The prostate is scanned from base to apex, using 5mm incremental trans-

verse sections. The gland volume is computed. For each transverse section, an outline of the prostate is drawn on the screen using the scanner's trackball. These contour diagrams provide an incremental 2-D reconstruction of the gland that can subsequently be digitized into a volume-rendered 3-D reconstruction which forms the basis for radiation dosimetry. The treatment-planning computer then provides a seed distribution plan for the patient.

The second stage or next step is the prostate implant itself.

Seed implantation

The radioactive seeds are either loaded into 17 or 18 gauge 20cm needles, or into semi-automatic devices. Their stylets are blunt-ended and the seeds are pushed out into the prostate by withdrawing the needle over the stylet. Usually 20-40 needles are used, each containing between 1-5 seeds. These seeds can either be loose or preloaded onto catgut strand (Rapid Strand™ by Oncura), see Fig. 2. Loose seeds have to be separated in the needles with catgut spacers.

The implant is performed in the operating theatre, with the patient in the dorsal lithotomy position, as for the prostate volume study. Either general or spinal anesthesia can be used. The position of the transducer is adjusted until the volume study images are replicated.

The needles containing the radioactive seeds are inserted through the perineum guided by the template. Both transverse and sagittal imaging can be used to guide each needle to its predetermined position in the gland. The needles appear in transverse images as bright echogenic dots. When each needle is confirmed to be in the correct position, the seeds are loaded into the

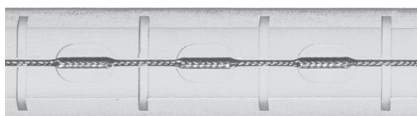


Figure 2. Radioactive seeds preloaded onto an Oncura™ catgut strand.

gland by withdrawing the needle over the stylet.

Bladder irrigation and/or cystoscopy is performed at the end of the procedure. The patient is generally discharged within 24 hours.

CONCLUSION

Prostate brachytherapy is now well established as a credible treatment for organ-confined prostate cancer with good clinical results^{3,4}.

The B-K Medical biplane brachytherapy transducer, stepping unit and scanners constitute a precision system which facilitates modern prostate brachytherapy. The ability to image the gland in both transverse and sagittal planes allows accurate monitoring of seed placement.

The biplane probe 8658 is compatible with all B-K Medical scanners except 1402 and 1101.

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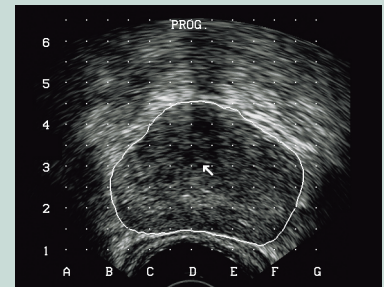


Figure 3. Prostate Volume Study: A series of 5mm axial scans is obtained with the patient in the dorsal lithotomy position.

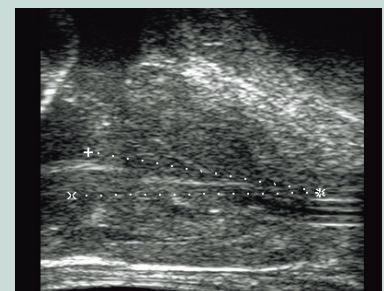


Figure 4. Sagittal scan with measurements. Note the clear view of the verumontanum

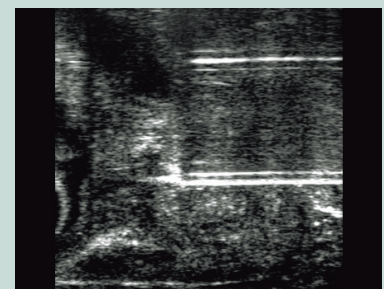


Figure 5. Sagittal scan with needles in the prostate

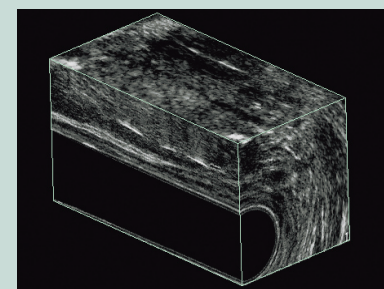


Figure 6. 3D projection of seeds.

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