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Three-layer template for low-dose-rate remote afterload transperineal interstitial brachytherapy

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Our experience with a low-dose-rate (LDR) remote afterload device (RAD) for transperineal interstitial brachytherapy with ^{192}Ir wires has shown that in commercially available templates the smallest distance between individual needle guides is 10 mm due to the fixation technique used; the fixation of the guides also turned out inadequate since these tended to move uncontrollably when attached to the LDR RAD. Therefore, a special three-layer template was developed at our Institute. The two outer plates of the device are joined to form a rigid unit; there is a third, longitudinally movable plate placed in between the other two. The distribution of holes for guides insertion is identical in all three plates, and can be adjusted as required. By tightening two screws mounted on the outer plates, the medium plate is moved longitudinally, thus simultaneously fixing all the guides inserted. We believe that this device proves very useful, thanks to the simplicity of technical solution, more suitable distribution of holes for guides as well as firm and simultaneous fixation of all guides.

Key words: brachytherapy-methods; interstitial brachytherapy, transperineal template

Introduction

According to the rules of Paris system for dose calculation,[1,2] a template for needle guides fixation in the interstitial brachytherapy using low-dose-rate (LDR) remote afterloading device (RAD) with ^{192}Ir wires should provide a geometrically correct distribution of needle guides in the treated volume, and also ensure strong fixation of the guides during implantation.

Evaluating our previous work,[3] we found commercially available templates imperfect as a result of the guide fixation method used.[4-6] The distribution of holes for guides in these templates permitted for a minimum distance of 10 mm between guides. Taking into account the irregular shape of tumors implanted, this would not always enable an optimum distribution of guides in the implanted area. Besides, the fixation of guides in these templates was insufficient as they would move uncontrollably while attached to RAD during implantation.

Therefore, at the Department of Brachytherapy of the Institute of Oncology in Ljubljana, we have made a template which is devoid of the previously mentioned drawbacks.

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Design

We have developed and constructed a three-layer template presented in Figure 1. The two thinner, 3 mm thick outer plates are joined in four corners with screws and distance washers to form a rigid unit. The third, median 5 mm thick plate is movable longitudinally with respect to the outer plates. All three plates have identical perforations, the hole diameter being the same as the outer diameter of

the guides. The guides are inserted through the three plates and fixed by tightening of the two screws mounted on the outer plates. At doing this, the median plate slides longitudinally; the movement is gradual which allows precise exertion of pressure on the guides and thus simultaneously fixing all the guides inserted. This is necessary to prevent guide distortion and at the same time ensure sufficient shear forces required for stable fixation of the guides inserted. Generally, we use a template with regular 5-mm square hole distribution pattern which ensures good coverage of the treated volume. Its low weight, simple construction and solid fixation of conveniently distributed guides solve the problems associated with massiveness, elaborate construction, and inadequate distribution of holes which results in inappropriate distribution of guides in the existing commercially available templates.

Conclusion

Our experience with the presented template indicates that this meets the requirements for LDR remote afterload interstitial brachytherapy. It enables greater flexibility as to the selection of distance between guides, and their distribution with respect to the shape and size of the volume treated. Also, the fixation of the guides inserted is simultaneous, which prevents the guides from being distorted. Accordingly, when attached to RAD tubes, no uncontrollable movements may occur during implantation.

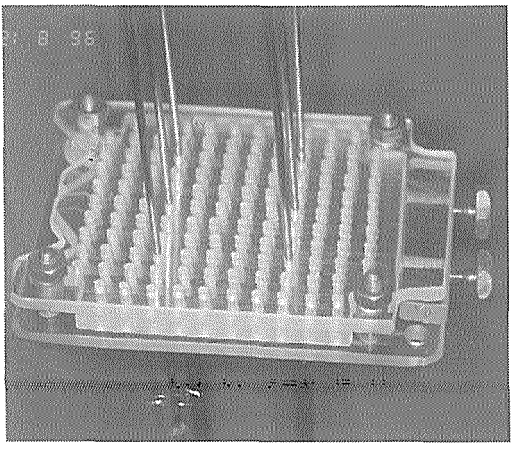

Figure 1A. Template assembly for LDR RAD interstitial brachytherapy with ^{192}Ir wires designed and worked out in the Institute of Oncology, Ljubljana, Slovenia.

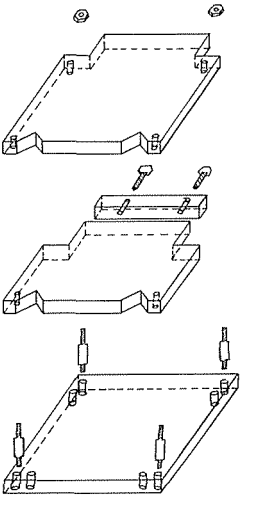

Figure 1B. Schematic description of template.

We believe that the template designed and worked out in the Institute promotes the quality of work with LDR RAD in our transperineal interstitial brachytherapy.

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