

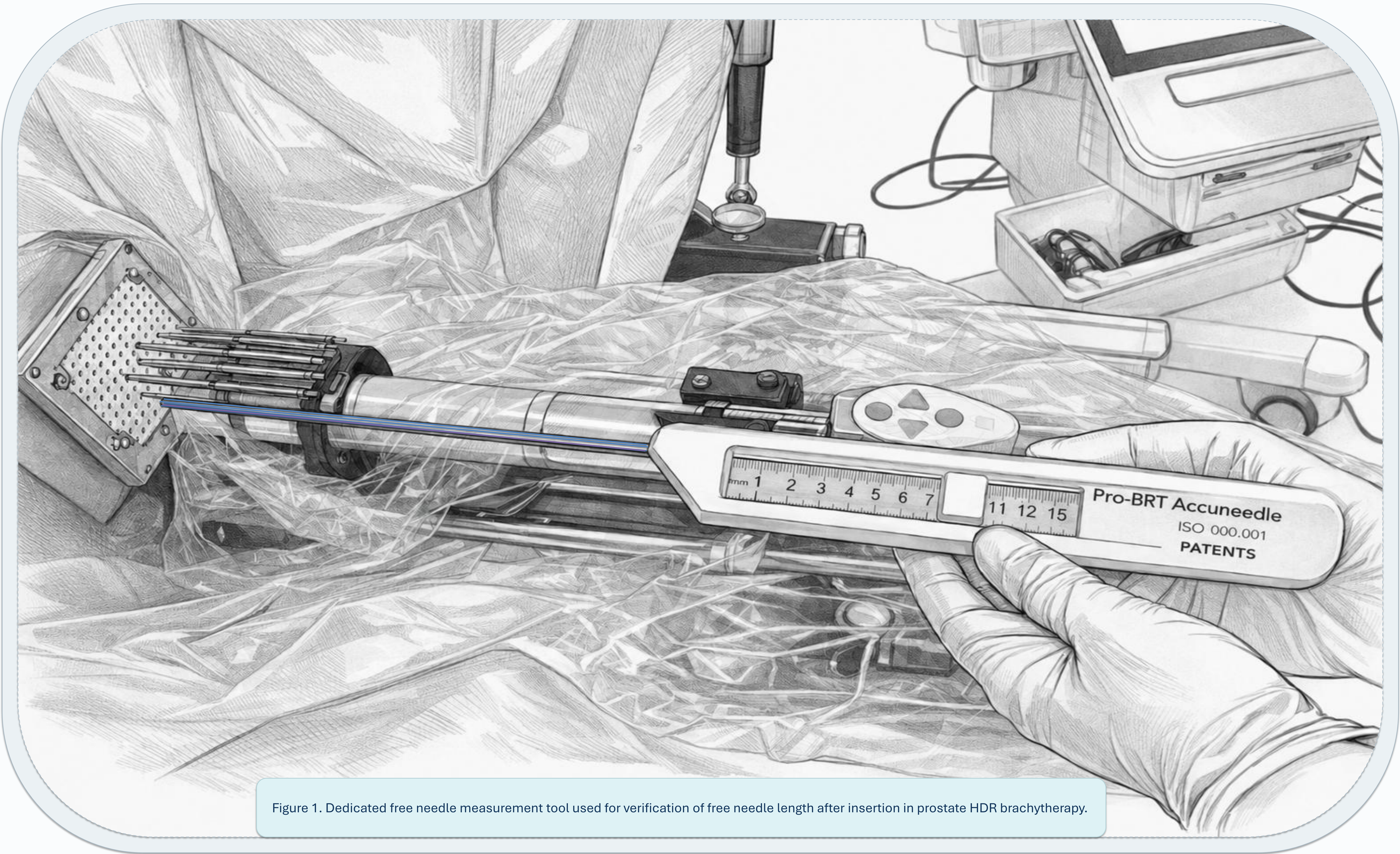


Figure 1. Dedicated free needle measurement tool used for verification of free needle length after insertion in prostate HDR brachytherapy.

Purpose

Accurate free needle length measurement is required in prostate HDR brachytherapy to ensure reliable reconstruction of dwell positions during treatment planning. In clinical practice, measurements are often performed using a standard ruler, which may require the operator to lean or adopt an awkward working position.

This process can be further complicated by the close placement of multiple implanted needles. When needles are positioned close together, there is a risk of measuring the wrong needle, particularly during a busy clinical workflow. In addition, the ruler must be positioned in direct contact with the needle while the measurement scale remains visible to the operator. This can be inconvenient, especially when access is limited by the patient position, sterile draping, or other equipment. These practical limitations may reduce measurement comfort and make the procedure less ergonomic.

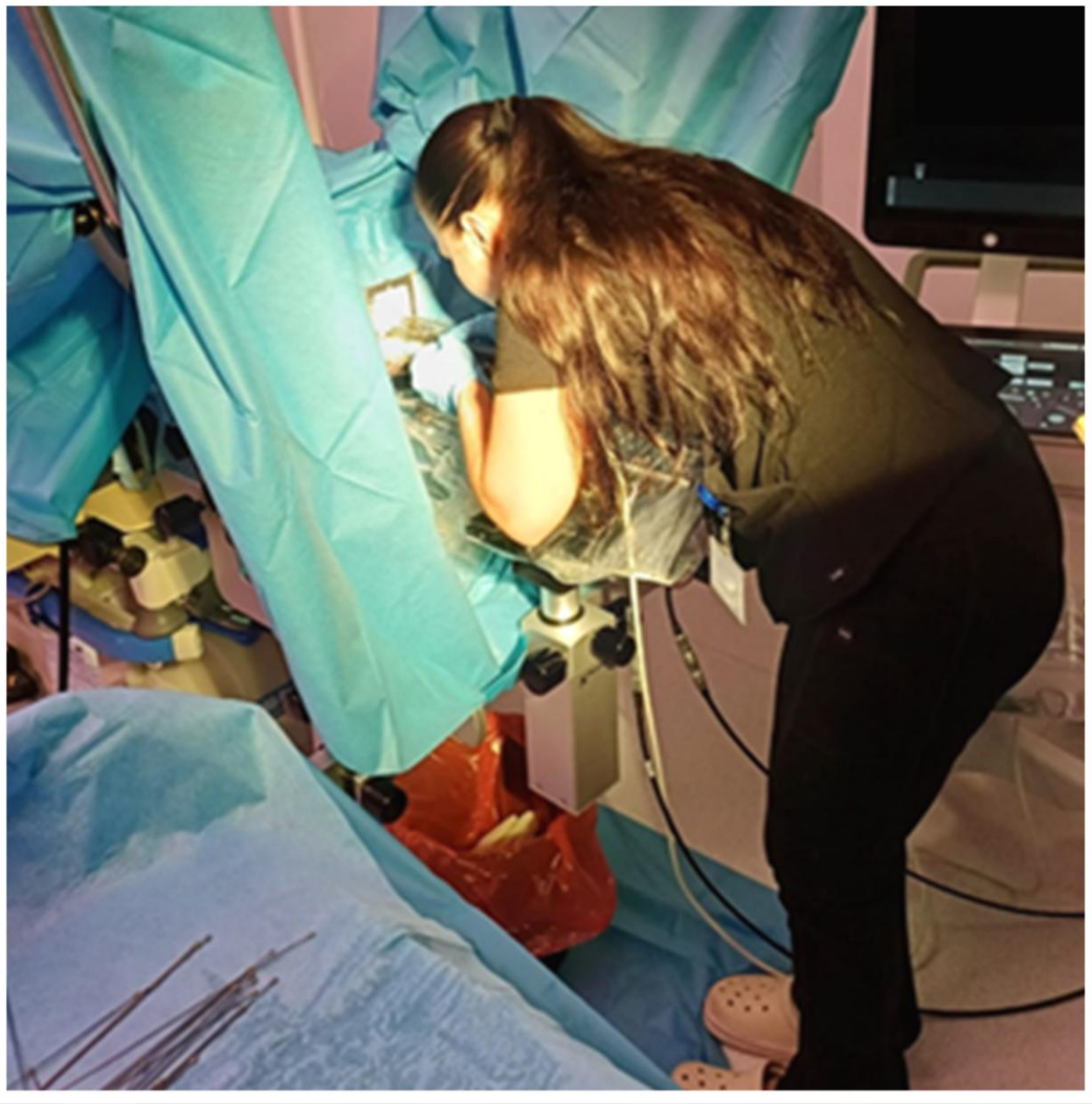


Figure 2. Free needle length measurement using a standard ruler.

Methods

A mechanical measuring device was introduced for verification of free needle length after insertion in prostate HDR brachytherapy. The device was designed to support measurement without direct patient contact.

The device consists of a narrow needle-alignment tube, a movable plunger, and an integrated scale. Its design allows the readout to be performed away from the crowded needle template, improving scale visibility and reducing the risk of selecting an adjacent needle.

Free needle length measurements obtained with the device were compared with those performed using a standard ruler. Usability, visibility of the measurement scale, ease of needle identification, and operator ergonomics were assessed during the procedure.

Results

The device was evaluated during prostate HDR brachytherapy procedures in 10 patients. Free needle length measurements obtained with the dedicated device were comparable to those obtained using a standard ruler.

In cases where two independent ruler measurements were inconsistent, an additional ruler measurement was performed. This third measurement was consistently in agreement with the measurement obtained using the dedicated device.

Users reported that the device was more ergonomic than the standard ruler, particularly due to improved working position and easier readout. The measurement workflow was shortened by approximately one minute.

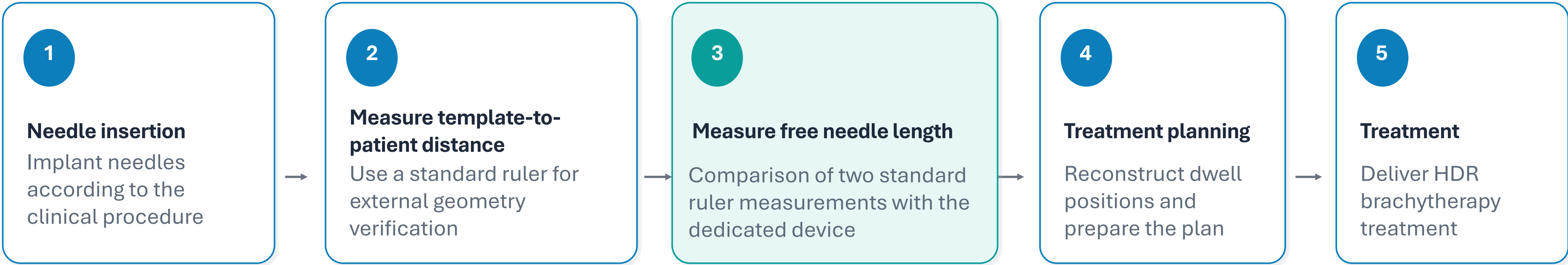


Figure 3. Prostate HDR brachytherapy treatment workflow.

Conclusion

The dedicated free needle measurement device provided measurements comparable to those obtained with a standard ruler. Its use improved ergonomics, scale visibility, and confidence in needle identification during prostate HDR brachytherapy.

Although the reduction in workflow time was limited, the device simplified the measurement process and reduced operator discomfort. It may therefore support a more standardized and user-friendly approach to free needle length verification.

Ruler vs dedicated tool

Accuracy	Comparable / Improved
Ergonomics	Improved
Workflow	Simplified

Acknowledgements / Disclosure

The needle measurement tool was designed by the author and prototyped by Diagnomatic, where the author is currently employed. Testing was performed at the University Clinical Centre in Katowice, where the author also works. The author thanks the clinical team for their support during the evaluation.

