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Sharp vs Blunt Interstitial Needle Catheters: Rates of Procedural Complications After Hybrid High-dose-rate Brachytherapy for Patients with Cervical Cancer

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Abstract
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Abstract

Purpose: High-dose rate (HDR) brachytherapy has been shown to improve outcomes and decrease side effects in patients undergoing treatment for locally advanced cervical cancer. Hybrid applicators are increasingly used to achieve EMBRACE II dosimetric goals. An acute potential complication, however, with use of hybrid applicators is risk of vaginal bleeding. At our institution, when first implementing hybrid applicators, sharp needle catheters were utilized. We transitioned to blunt needle catheters as we noticed significant vaginal bleeding on removal of sharp catheters. We, therefore, evaluated the rate of vaginal bleeding requiring vaginal packing after HDR brachytherapy with use of a hybrid applicator before and after implementation of blunt needles.

Methods: After IRB approval, we retrospectively reviewed patients with advanced cervical cancer treated at our institution from April 2024 to September 2025 treated with HDR hybrid applicators. Blunt needles were implemented in our clinic in June 2025. We examined vaginal bleeding rates requiring vaginal packing upon removal of hybrid HDR brachytherapy applicators. When vaginal packing was required, packing with recombinant thrombin was left in place for 20 minutes before reassessment of bleeding. Additionally, we examined dosimetric differences between fractions.

Results: From April 2024 through September 2025, 11 patients were treated with hybrid HDR brachytherapy (7 with sharp needles and 4 with blunt needles) for a total of 29 fractions (17 with sharp needles and 12 with blunt needles). Median needles used per fraction were 6 for both sharp (range 4-12) and blunt (range 4-6) needles. When sharp needles were used the per-fraction rate of vaginal bleeding requiring vaginal packing was 23.5%, and 57% of patients required vaginal packing at some point during treatment. In contrast, patients treated with blunt needles had a 0% per-fraction rate of bleeding. No patient in either group required any additional intervention for hemostasis. Patients who experienced significant bleeding were transitioned to intracavitary brachytherapy in subsequent fractions. With respect to dosimetry, there was no significant difference in EQD2 to HR-CTV between sharp and blunt needles (Mean ± Standard deviation 86.4 ± 1.2 Gy vs 88.6 ± 2.8 Gy, p = 0.22) D2cc values for bladder (79.1 ± 4.6 Gy vs 79.6 ± 2.8 Gy), sigmoid (64.3 ± 8.0 Gy vs 61.8 ± 9.5 Gy), and bowel (57.5 ± 10.2 Gy vs 65.6 ± 9.5 Gy). However, rectal D2cc was statistically lower in the sharp catheter needle group (56.0 ± 4.9 Gy vs 47.6 ± 1.6 Gy, p = 0.003).

Conclusion: Blunt needle catheters were associated with a lower risk of vaginal bleeding compared to sharp needle catheters, without increased difficulty in placement. Dosimetric parameters were comparable between groups, suggesting that blunt needle catheters may reduce bleeding risk without compromising target coverage or OAR sparing.