



Comparative Study of the Ocado and Modified Ocado Methods for Achieving Accurate Cavoatrial Junction Placement in Peripherally Inserted Central Catheters (PICCs)

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Background

Peripherally inserted central catheters (PICCs) are central venous access devices used for medium- to long-term therapies, with optimal tip placement at the cavoatrial junction (CAJ) to reduce complications.³

Esper Ocado, a vascular access nurse at The University of Texas MD Anderson Cancer Center (UTMDACC), developed a landmark-based technique in 2006 to standardize bedside catheter length estimation, now known as the Ocado Method.

The Ocado Method involves measuring from the insertion site to a clavicular point defined by a vertical projection from the earlobe to the clavicle, with the patient positioned at a 45° head-of-bed elevation, the head in a neutral position, and the arm abducted at 45°. An additional 10 cm is added for right-sided insertions and 15 cm for left-sided insertions.^{4,5}

An internal pre-study survey of vascular access nurses revealed that the Ocado Method has been practiced with many variations. We found from the survey that the nurses' variations extended from patient positioning (supine vs. 45° head-of-bed elevation), shoulder abduction angle (45° vs. 90°), and anatomical endpoint selection (mid-clavicle, two-thirds clavicle, or head of clavicle).

Evolving from the original Ocado Method through input from the majority of experienced nursing staff, the Modified Ocado Method refines the measurement distances to 12 cm for right-sided and 16 cm for left-sided insertions, while maintaining identical patient positioning and landmark technique.

This study evaluates and compares the predictive accuracy of the original Ocado Method and Modified Ocado Methods for estimating PICC tip position at the cavoatrial junction under standardized conditions.

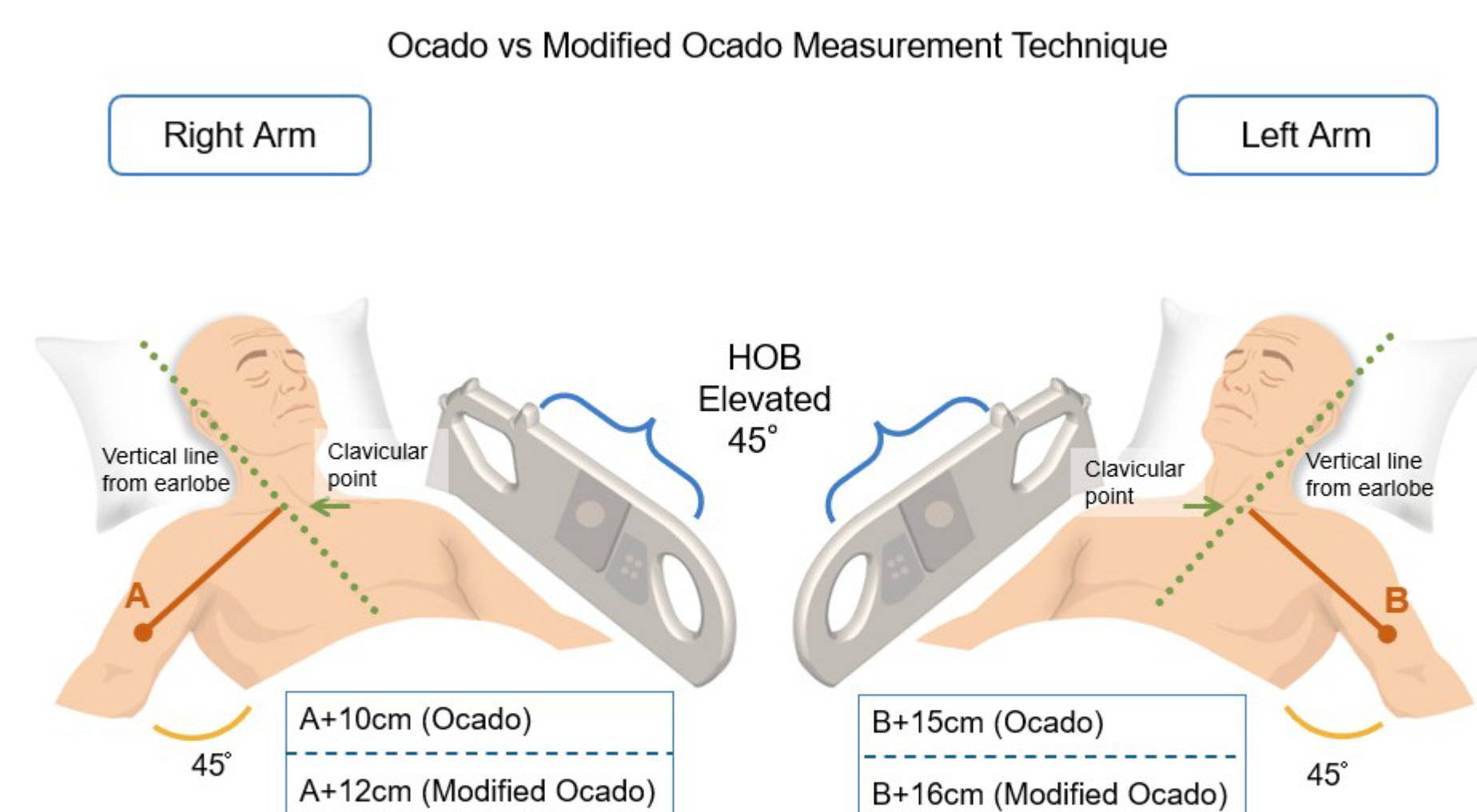


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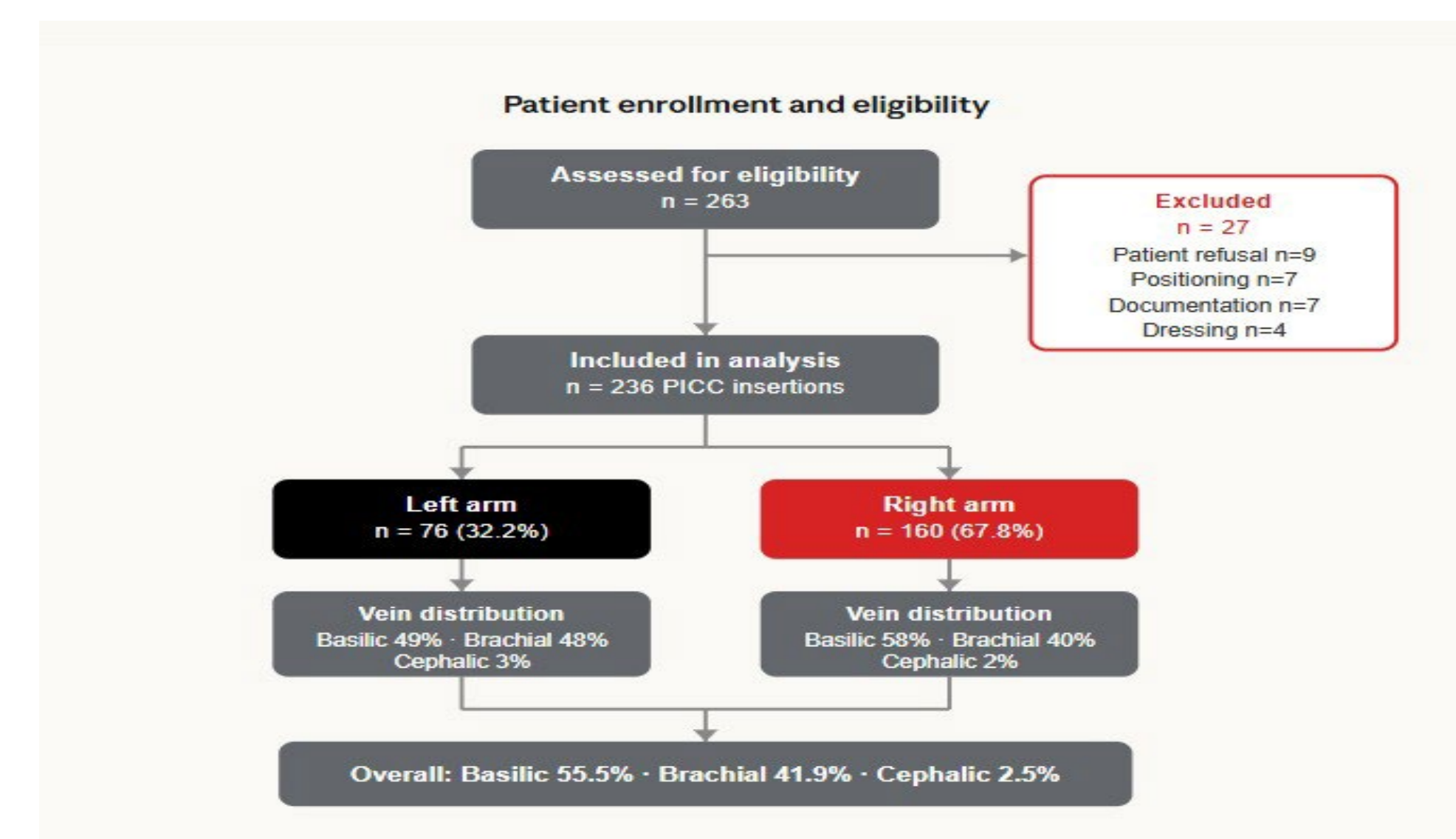
Methods

This study was conducted from December 2024 to July 2025 and included adult patients (≥18 years) with existing PICCs placed by the vascular access team at UTMDACC. Patients were identified during routine dressing changes. Patients included had no post-insertion catheter manipulation following initial placement, and a radiologist-interpreted imaging report documenting catheter tip position at the CAJ following PICC placement. Patients were excluded if the insertion site was not clearly visualized due to a non-transparent or non-intact dressing, catheter length documentation was incomplete, standardized positioning could not be maintained or swelling or infection along the catheter pathway was present that could impact measurement accuracy.

Prior to data collection, four experienced vascular access nurses underwent standardized training in measurement technique, anatomical landmark identification, and patient positioning to ensure consistent positioning and landmark identification.

For each eligible patient, a single measurement was obtained using standardized positioning (head-of-bed elevated at 45°, arm abducted at 45°, head in neutral alignment). The distance was measured from the insertion site to a clavicular landmark defined by a vertical projection from the ipsilateral earlobe to the clavicle. Standardized tools were utilized during measurement to maintain consistency in positioning and angle alignment. As both the original Ocado and Modified Ocado methods utilize identical anatomical landmarks and positioning, the measurement was performed once, and catheter length estimates were derived by applying method-specific additions: 10 cm (right) or 15 cm (left) for the original Ocado Method, and 12 cm (right) or 16 cm (left) for the Modified Ocado Method. Both methods were applied to each patient using the same measured baseline distance.

The reference standard for catheter tip location was the radiologist-interpreted imaging report. Tip position classification was based solely on documented radiologic interpretation.



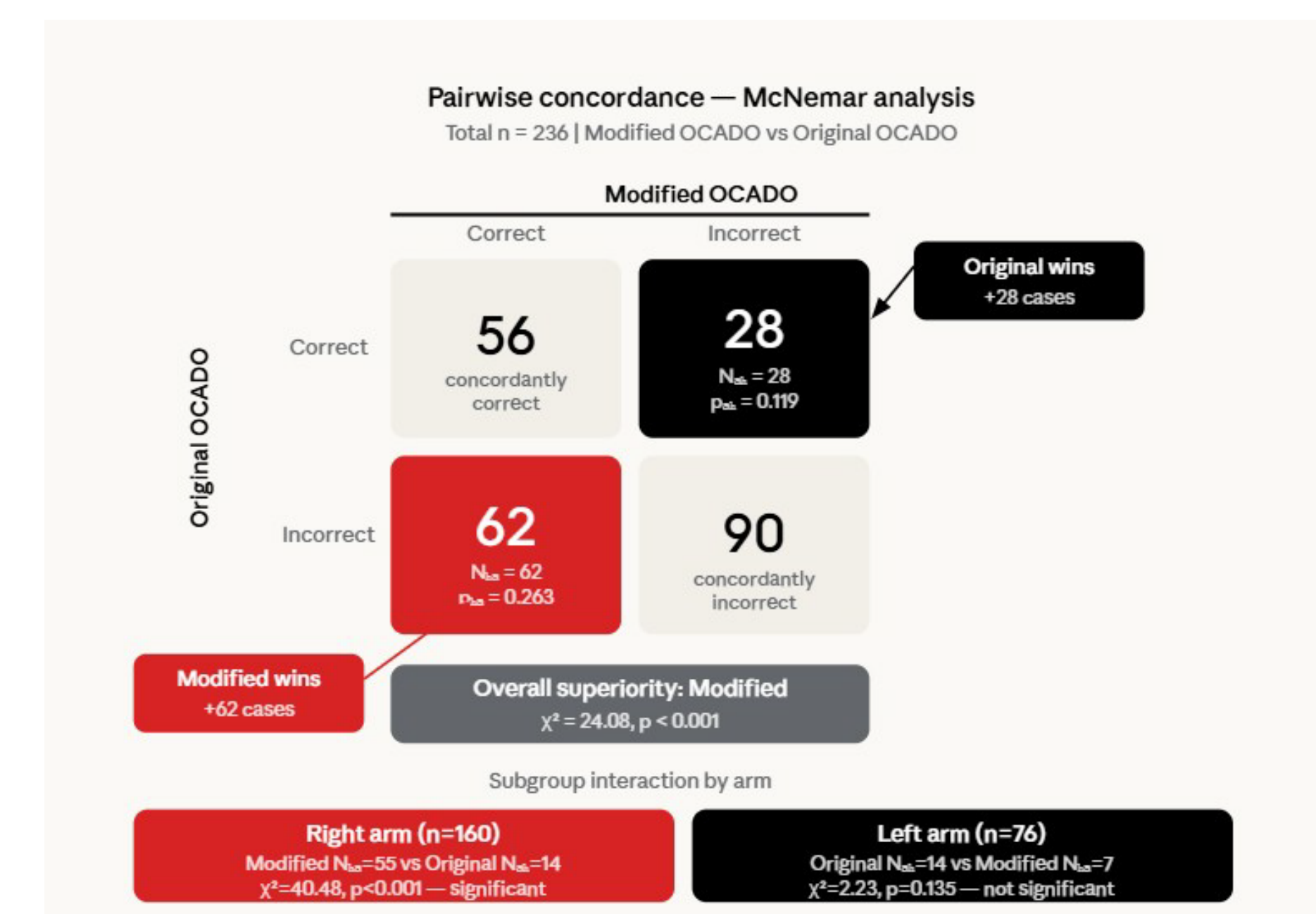
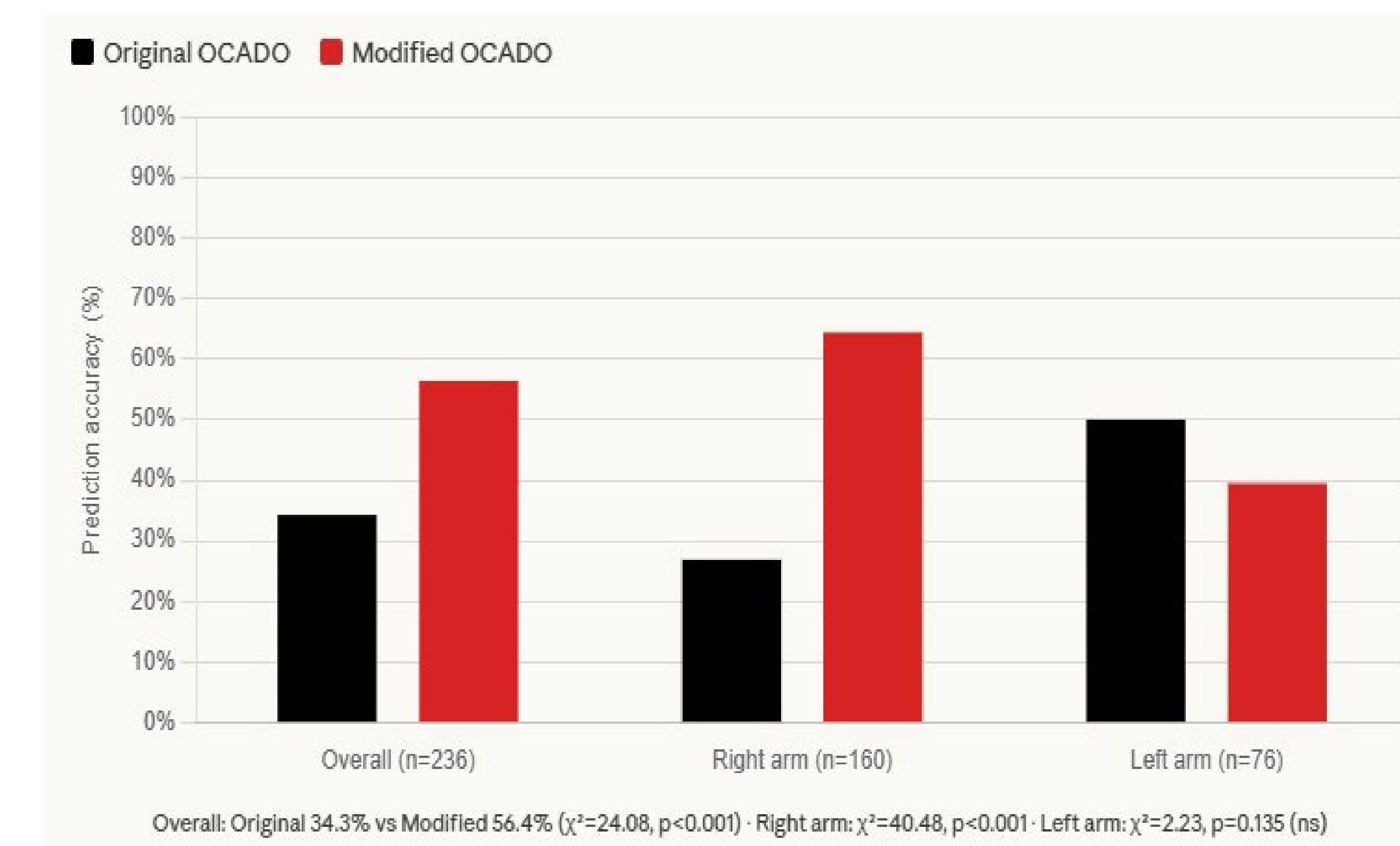
Results

Of 263 patients assessed for eligibility, 27 were excluded for the following reasons: patient refusal (n = 9), non-transparent or compromised dressings (n = 4), inability to maintain standardized positioning (n = 7), and incomplete catheter length documentation (n = 7). A final sample of 236 patients was included in the analysis.

The majority of PICCs were placed in the right upper extremity (n = 160, 67.8%), with 76 insertions (32.2%) on the left side. The basilic vein was the most frequently cannulated vessel (n = 131, 55.5%), followed by the brachial vein (n = 99, 41.9%) and the cephalic vein (n = 6, 2.5%).

The original Ocado Method yielded an overall CAJ accuracy of 34.3% (81/236), with higher accuracy on the left arm (50.0%) than the right (26.9%). The Modified Ocado Method demonstrated superior overall accuracy at 56.4% (133/236), representing an absolute improvement of 22.1 percentage points. However, the Modified Ocado Method performed substantially better on the right side (64.4%) than the left (39.5%), while the original Ocado Method retained a relative advantage on the left (50.0% vs. 39.5%).

McNemar's test demonstrated statistically significant overall superiority of the Modified Ocado Method ($\chi^2 = 24.08$, $p < 0.001$). Subgroup analysis revealed no statistically significant difference between the two methods for left-sided insertions ($\chi^2 = 2.23$, $p = 0.135$), whereas the Modified Ocado Method demonstrated a pronounced and statistically significant advantage for right-sided insertions ($\chi^2 = 40.48$, $p < 0.001$).



Conclusions

The Modified Ocado Method demonstrated higher overall accuracy than the original in predicting PICC tip position at the cavoatrial junction (56.4% vs. 34.3%). Accuracy varied by insertion side: the modified Method performed significantly better for right-sided insertions (64.4% vs. 26.9%), while the original Method retained a non-significant advantage for left-sided insertions (50.0% vs. 39.5%). These findings highlight a clinically important side-dependent difference in predictive performance between the two methods.

References

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