OPTIMIZED ARGON PLASMA COAGULATION IN EMERGENCY GYNECOLOGIC SURGERY: STUDY DESIGN AND CLINICAL OUTCOMES

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Abstract: *Objective: To evaluate the efficacy and safety of optimized argon plasma coagulation (APC) as a method of hemostasis and coagulative tissue treatment during emergency gynecologic interventions. Methods: A prospective comparative study was performed. The APC group (n=70) included operations using APC, while the control group (n=50) underwent surgery with conventional hemostatic techniques. Optimization of APC involved individualized selection of parameters: 35–50 W power, 1.5–2.0 L/min argon flow, and exposure up to 3 seconds with visual control of the coagulation zone. Outcomes assessed included operative time, blood loss, complication rate, pain intensity on the visual analogue scale (VAS), time to temperature normalization, and length of hospital stay. Results: Optimized APC reduced postoperative complications from 24.0% to 8.6%, decreased blood loss and pain severity, and shortened hospital stay without prolonging surgery.*

Keywords: *argon plasma coagulation, emergency surgery, parameter optimization, blood loss, postoperative complications*

Materials and Methods

The study was conducted in two stages. In the first stage, a retrospective analysis of hospitalizations and surgical procedures performed in 2020–2022 was carried out. In the second stage, a prospective comparative study was performed. In the prospective cohort, 70 women aged 19–45 years were included in the main analysis out of 150 patients who underwent APC-assisted interventions; all met the inclusion criteria and had no contraindications. The control group comprised 50 patients of comparable age who underwent surgery without APC. The main emergency conditions included ectopic pregnancy, ovarian apoplexy, torsion of an ovarian cystoma pedicle, necrosis of a myomatous node, and bleeding after cervical procedures.

APC was performed using the ELECTROPULSE S-350RF electrosurgical system. The optimized technique involved individualized parameter selection: 35–50 W power, 1.5–2.0 L/min argon flow, and exposure up to 3 seconds with control of the coagulation zone. The following outcomes were evaluated: operative time, blood loss volume, complication rate, pain severity (VAS), time to temperature normalization, and length of hospital stay.

Results

Optimized APC provided clinically meaningful improvement in early outcomes. The rate of postoperative complications decreased 2.8-fold and was 8.6% in the APC group versus 24.0% in the control group. Pain intensity was lower (VAS 3.1±0.8 vs 5.6±1.1), temperature normalized faster (on average 1.2 vs 2.5 days), and hospital stay was shorter (4.3±1.2 vs 5.8±1.6 days; $p<0.01$). Blood loss decreased (122.4±35.2 mL vs 216.8±47.5 mL; $p<0.01$), while operative time did not increase (mean 44.7±6.8 min).

Outcome	APC (n=70)	Control (n=50)
Postoperative complications	8.6%	24.0%
Pain, VAS (points)	3.1±0.8	5.6±1.1
Time to temperature normalization (days)	1.2	2.5
Blood loss (mL)	122.4±35.2	216.8±47.5
Hospital stay (days)	4.3±1.2	5.8±1.6
Operative time (min)	44.7±6.8	not increased

Discussion. The findings confirm that, in emergency interventions, controlled, rapid, and tissue-sparing hemostasis is critical. The non-contact nature of APC and the ability to precisely dose energy likely explain the reduction in blood loss and the lower severity of postoperative pain. Standardization of parameters (power/flow/exposure) is especially important to minimize thermal spread and improve reproducibility of results.

Conclusion. Optimized argon plasma coagulation is an effective and safe hemostatic method in emergency gynecology. Use of an individualized technique (35–50 W, 1.5–2.0 L/min, up to 3 seconds) is associated with fewer complications, reduced blood loss, and faster recovery without prolonging surgery. The method can be incorporated into clinical protocols provided that staff training and monitoring are implemented.

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