DOI: https://doi.org/10.5554/22562087.e1115 **CASE REPORT**

New devices, new problems. Pneumomediastinum secondary to therapy with Renuvion/J-Plasma®. Case report

Nuevos dispositivos, nuevos problemas. Neumomediastino secundario a terapia con Renuvion/J-Plasma®. Reporte de caso

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Received: 24 January, 2024
Accepted: 20 April, 2024
Online first: 7 June, 2024

Cómo citar este artículo: Montenegro ÁA, Bermúdez CA, Pabón Henao T, Torres Zúñiga S, Triana LM. New devices, new problems. Pneumomediastinum secondary to therapy with Renuvion/J-Plasma®. Case report. Colombian Journal of Anesthesiology. 2024;52:e1115.

Abstract

The incorporation of new technologies such as ultrasound, J-Plasma (helium plasma) and MicroAire (energy-assisted liposuction) has facilitated liposculpture procedures, resulting in greater patient satisfaction. The benefits of these technologies are accompanied by low reported complications; this case is the fourth description of pneumomediastinum secondary to the use of Renuvion® (J-Plasma) after liposuction for fat removal in the arms and thighs. This rare complication should be considered as part of the differential diagnosis during the study of clinical dyspnea and subcutaneous emphysema in the postoperative period.

Keywords: Lipectomy; Mediastinal emphysema; Dyspnea; Renuvion®/J-Plasma, Case report; Anesthesia; Anesthesiology.

Resumen

La incorporación de nuevas tecnologías, como ultrasonido, J-Plasma (plasma de helio) y el Microaire (liposucción asistida por energía), ha facilitado los procedimientos de lipoescultura consiguiendo una mayor satisfacción del paciente. Los beneficios de estas tecnologías se acompañan de bajas complicaciones reportadas; el presente caso constituye la cuarta descripción de neumomediastino secundario a la utilización de Renuvion® (J-Plasma) posterior a la extracción de grasa en brazos y muslos por medio de liposucción; esta infrecuente complicación se debe considerar diagnóstico diferencial en el estudio de presentación clínica de disnea y enfisema subcutáneo durante el posoperatorio.

Palabras clave: Lipectomía; Enfisema mediastinal; Disnea; Renuvion®/J-Plasma; Reporte de caso; Anestesia; Anestesiología.

Introduction

The incorporation of new technologies such as ultrasound using J-Plasma (helium plasma) and MicroAire (energy-assisted liposuction) has facilitated liposculpture procedures, resulting in greater patient satisfaction and benefits (1,2); moreover, these technologies are associated with low complications, as described so far. This case is the fourth description of pneumomediastinum associated with the use of the Renuvion® (J-Plasma) technology, following liposuction for fat removal from the arms and thighs (3-5) .

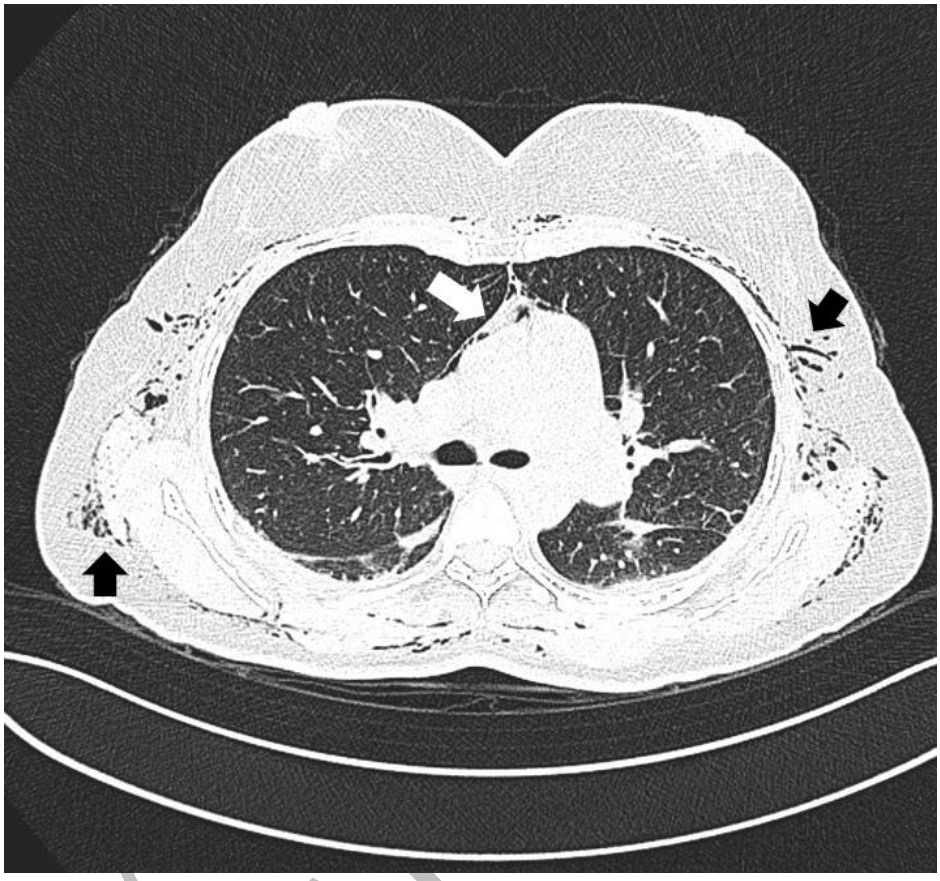
Case report

A 52-year-old female patient with no prior history of disease who underwent conventional liposuction of arms and lateral aspect of the thighs after tumescent solution infiltration (a mix of crystalloid plus 2 cm^3 of epinephrine [2:1.000]). After removing approximately 7,000 cm^3 of fat, skin tightening was performed using the Renuvion J-Plasma® technology. For the procedure, the generator was set at 80% power and helium flow at 2 liters per minute (L/min); the intervened body areas were treated on average with 6 repetitions each. In the immediate postoperative period the patient recovered well and was discharged from the hospital on the same day.

Four days after the surgical procedure, the patient presented to the emergency service complaining of one day of symptoms consisting of dyspnea, adynamia, headache, chills and generalized pain. Vital signs at presentation showed increased heart rate and temperature (blood pressure: 124/61 mm Hg; heart rate: 97 bpm; respiratory rate: 22 bpm; temperature: 37,9 °C). Findings on physical examination included painful facies, pale mucosas, and dressings on the intervened extremities showing signs of serosanguinous drainage but no signs of perilesional infection; crepitations were palpated over the sternal, supra and infraclavicular region, suggesting subcutaneous

emphysema; the abdomen was soft and depressible on palpation, with no signs of peritoneal irritation. Paraclinical tests on admission showed severe anemia (hemoglobin 6.0 g/dL) (Table 1), associated with low cardiac output signs due to slow capillary filling, prompting transfusion of two units of red blood cells and the administration of procoagulants (tranexamic acid), oxygen supplementation through nasal cannula with 32% FiO_2% (approximately) and central venous catheter placement. Due to signs of hypoperfusion in the first few hours, pulmonary artery CT angiography was performed, ruling out pulmonary embolism, but showing pneumomediastinum distributed along the neck and chest, and confirming generalized subcutaneous emphysema (Figure 1). The patient was assessed by the Thoracic Surgery and Plastic Surgery services which indicated clinical observation and monitoring in the intensive care u nit, with no need for additional surgical interventions.

Figure 1. Chest CT. Pneumomediastinum (white arrow). Subcutaneous pneumomediastinum distributed to the chest (black arrows).



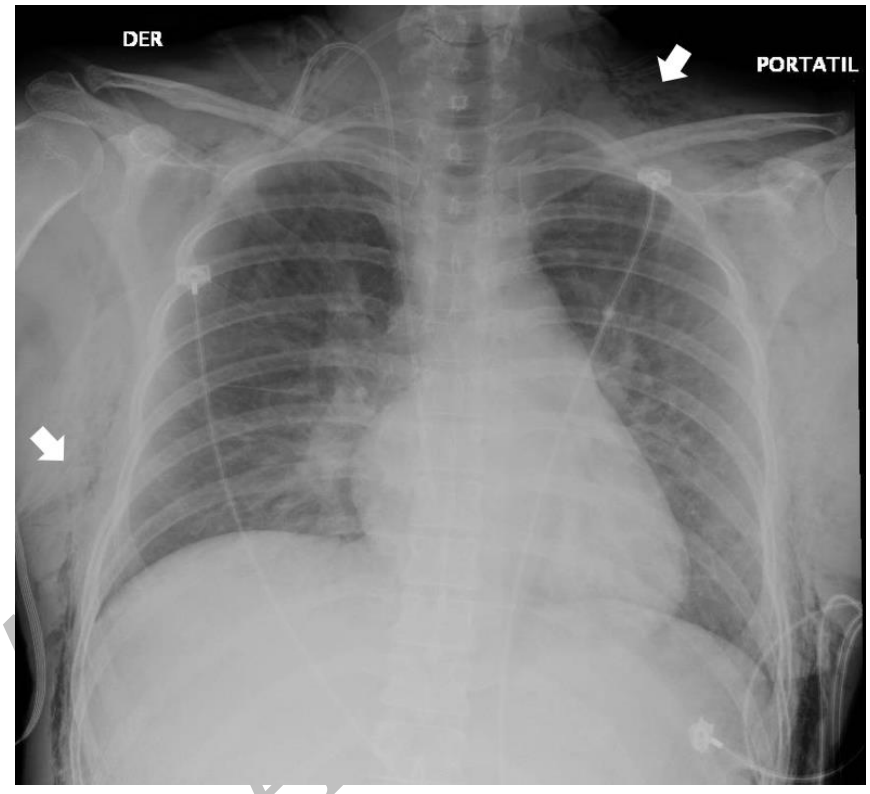
Source: Authors.

Because of increased temperature on admission, empirical antibiotic coverage was initiated with intravenous (IV) administration of piperacillin tazobactam 4.5 g every 6 hours + vancomycin 1 g IV every 12 hours. Initial blood cultures came back negative four days later, leading to discontinuation of antimicrobial therapy after 96 hours.

Intensive care monitoring was carried out during 48 hours, allowing to confirm dyspnea resolution and hemodynamic stability during the observation period. The follow-up chest

X-ray showed subcutaneous emphysema along the chest wall and neck, with no significant changes on follow-up (Figure 2). Given a satisfactory clinical course, the patient was discharged after five days of observation.

Figure 2. Chest X-Ray. Subcutaneous emphysema distribution in the neck and chest (white arrows).



Source: Authors.

Table 1. Main laboratory tests on admission to the ICU and after 24 hours.

Test	On admission	24-hour follow-up in ICU
Hb (g/dL)	7.5	7.2
Plaquetas	246,000	210,000
PO_2 (mm Hg)	100,4	NR
PCO_2 (mm Hg)	36.7	NR
Lactate (mmol/L)	5.5	1.39
Creatinine (mg/dL)	0.69	0.63

NR: no record.

Source: Authors.

Discussion

Plasma-based devices have been used since the 1990s with the aim of heating and tightening collagen in the subdermal space in order to improve skin laxity (5). The J-Plasma/Renuvion® uses helium to allow for easy ionization under low power, creating a steady and accurate output to achieve subdermal coagulation and effective soft tissue shrinkage. The tissue around the treatment area remains at a lower temperature, allowing for rapid cooling and immediate soft tissue shrinkage without unnecessarily heating the entire dermal thickness (6).

The use of technologies such as the J-Plasma/Renuvion® is relatively recent. The United States Food and Drug Administration (FDA) analyzed the technology and, on July 15, 2022, approved (K191542) a helium-based plasma device (Renuvion®; Apyx

Medical Corporation, Clearwater, FL) for soft tissue cutting, coagulation and ablation, and authorization 510(k) was granted for the use of Renuvion® in subcutaneous dermatological and esthetic procedures to improve the appearance of loose skin in the neck and submental region. In 2023, the FDA approved Renuvion®/J-Plasma for procedures designed to improve skin appearance by means of dermal rejuvenation or skin tightening (7). Given the recent approval by the FDA, the use of this therapy in the clinical setting may still be infrequent and hence the paucity of reported adverse events, with subcutaneous emphysema (8) and pneumomediastinum being among the most noteworthy. These complications have been found after the use of J-Plasma, and described as subcutaneous emphysema, usually involving the neck, chest and, in some cases, the abdomen, with no fatal outcomes reported (3-5). This case is the fourth description in the literature of pneumomediastinum associated with the use of J-Plasma technologies after a cosmetic procedure (3-5). In this case, J-Plasma/Renuvion® was used in accordance with the standards suggested by the device guideline, applying 80% power and 2 L/min flow, with 6 repetitions in each area (the helium-based radio frequency device guideline is based on the number of times the surgeon uses de handpiece to deliver energy to the treatment area. The recommended technique is to treat 1-1.5 cm of tissue per second, with retrograde activation in device settings of 60-80% power and helium flow within a range of 1.5-3 liters per minute) (7).

The subcutaneous emphysema and pneumomediastinum documented in this case are not easily explained in the light of the classic mechanisms that give rise to these complications — infection, visceral perforation or spontaneous alveolar rupture (4). Therefore, in this case, the etiology could be attributed to an excess of helium, the mechanism by which the device operates (3,4), possible together with a low conversion from gas to plasma in the generator.

As for the clinical presentation, similar to other reported cases, subcutaneous emphysema in the neck and anterior chest wall was described (3-5). Dyspnea, on the

other hand, has been described as a frequent symptom associated with pericardial and/or mediastinal gas extension (5). However, the diagnosis was established while looking for potential pulmonary embolism — a more frequent diagnosis (9) —- in a patient with risk factors and a consistent clinical picture in whom pulmonary CT angiography revealed pneumomediastinum as an incidental finding that explained the presence of dyspnea. The other symptoms such as asthenia, adynamia and headache could be explained by the drop in hemoglobin (Hb), believed to be the result of blood loss during the intra and postoperative periods. The rise in temperature prompted blood cultures and clinical exam, which ruled out a suspected infection.

Treatment of subcutaneous emphysema is usually conservative, focused on early identification and removal of the gas source, after ruling out a pneumothorax. Clinical observation is often required with the patient breathing ambient air o receiving an FiO_2 close to 100% in order to accelerate gas diffusion. The use of hyperbaric oxygen has been reported in one case, with similar good outcomes and fast recovery (5). In this case, the patient was managed conservatively with oxygen therapy through nasal cannula and 32% FiO_2 (approximately) with a good response and early discharge 96 hours after admission.

Conclusion

This case describes an infrequent complication associated with the use of J-Plasma/Renuvion, which must be considered as part of the differential diagnosis during the work-up for postoperative clinical dyspnea and subcutaneous emphysema.

Ethical responsibilities

Protection of human and animal subjects

The authors declare that the procedures followed were in accordance with the regulations of the relevant human research ethics committee, and in accordance with the World Medical Association and the Declaration of Helsinki.

Data confidentiality. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors obtained informed consent from the patients and/or subjects referred to in this article. These documents are kept by the corresponding author.

Conflict of interest: The authors have no disclosures to make.

Support and sponsorship: The authors declare not having received any support in the form of grants, equipment or medications from public or private organizations.

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