Research Article

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2026.64.010036

Miniinvasive Approach to Chronic Pleural Empyema Using Video Thoracoscopy and Intracavitary Vacuum System (Sivic)

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ARTICLE INFO

Received: December 12, 2025

Published: January 08, 2026

Citation: Claudio A Ruiz, Jose R Aranibar F, Walter G Otero, Alejandro Giacoia and Emiliano A Gloazzo. Miniinvasive Approach to Chronic Pleural Empyema Using Video Thoracoscopy and Intracavitary Vacuum System (Sivic). Biomed J Sci & Tech Res 64(3)-2026. BJSTR. MS.ID.010036.

ABSTRACT

Background: In the last 20 years, a continuous increase in patients with pleural empyema has been reported, even in developed countries. The treatment of chronic pleural empyema, despite antibiotic therapy and minimally invasive surgical procedures today, presents high morbidity and mortality.

Objective: Describe the experience in the treatment of patients with chronic pleural empyema through uniporter video thoracoscopy and intracavitary vacuum systems (SIVIC).

Material and Methods: Retrospective analysis of the medical records of 13 patients diagnosed with chronic pleural empyema from August 2023 to February 2024.

Results: Resolution of the infectious condition was largely achieved in all the treated patients (N;13), the closure of the empyema cavity was complete in 76.9% of the treated cases (10/13 patients), moment of stop.

Discussion: Our short experience shows us that this mini-invasive procedure is feasible, effective and safe, even in patients at high surgical risk, the high potential of this technique allows it to position itself as a first-choice surgical alternative for chronic pleural empyema.

Keywords: Chronic Empyema; Uniporter Video Thoracoscopy; Intracavitary Vacuum System (SIVIC)

Introduction

Chronic pleural empyema presents high morbidity and mortality in its evolution, despite having specific antibiotic therapy and minimally invasive surgical procedures at present [1-3]). In the last 20 years, a continuous increase in cases has been reported, even in developed countries [1] In the United States there are one million cases per year due to pneumonia; 10% develop empyema, that is, 32,000 patients and 30% of the latter will require a therapeutic surgical procedure (9,600 patients per year). The surgical treatment recommended in patients with chronic empyema [4,5,7], also called in the organization phase, is pulmonary decortication described by Delorme in 1884, with the aim of treating the infection and freeing the lung trapped by the cortex or pleural peel [4,7]. This procedure presents high complications and mortality, especially in elderly patients or patients with comorbidities [1,2,6]. A less aggressive surgical alternative is the thoracostomy presented by Eloesser in 1935, which acts on the cavity by creating a parietal hole that communicates it with the outside and allows its cleaning [1,2,6]. Although it is usually indicated in elderly patients who do not tolerate decortication, it is a mutilating procedure, since two ribs are resected and a 10 cm x 10 cm stoma with a long evolution and permanent parietal sequela is created [1].

The persistence of a residual pleural cavity secondary to a decortication or a thoracostomy forces the indication of even more invasive and mutilating procedures such as cavity myoblast and thoracoplasty [4], which generates permanent body deformity. With the aim of reducing operative risk and using less invasive and mutilating techniques, the vacuum system began to be used for the treatment of chronic empyema in elderly patients or those with comorbidities, using continuous intrapleural negative pressure [1,2,8]. The use of the continuous intrapleural vacuum system was presented in 2009 by Szklavari to accelerate thoracostomy closure [1,9]. Hoffman and Terra developed various alternatives using the stoma or a Mini thoracotomy with the dacio system with encouraging results [1,6]. A German work used the gastroscope for pleural toilet and intrapleural vacuum [2]. Our experience began in August 2023 in an elderly patient with chronic empyema with contraindication to perform decortication under general anesthesia, performing a mini- invasive approach to the empyema cavity through uniporter video thoracoscopy, pleural toilet and introducing the original surgical resource of the pleural peel section with Local anesthesia and sedation, to promote lung re-expansion and intracavitary vacuum system, which we call SIVIC. The fundamental objective of the intrapleural vacuum system is aspiration, decontamination of the chronic empyema cavity and lung re-expansion with the consequent closure of said cavity. The objective of this presentation is to show our experience in the treatment of chronic pleural empyema with the original procedure previously described, placing as the main objective of the study the clinical resolution of the infectious process and as secondary objectives, the evolution of the empyema cavity and operative mortality.

Materials and Methods

A retrospective analysis of the clinical histories of 13 patients with a diagnosis of chronic pleural empyema is presented from August 2023 to February 2024. This experience was carried out at the Alejandro Posadas National Hospital (6 patients) and Los Cedros Model Clinic (7 patients) being treated by the same surgical team.

Of the total patients (N= 13), 8 were male and 5 were female, with an age range between 39 and 80 years and an average age of 66 years. The symptoms that the patients presented were: dyspnea in 8 patients; chest pain in 9 patients and fever in 13 patients. The evolution time of the clinical picture ranged from 25 to 60 days with an average of 37 days. Three patients had previous pleural drainage and one patient had a previous video thoracoscopic pleural drainage and toilet and was admitted with purulent discharge from a surgical wound. All patients underwent a chest x-ray on admission and subsequently a chest computed tomography. The indication for performing video thoracoscopy and SIVIC was in all those patients with chronic empyema or in the organizational stage diagnosed by computed axial tomography of the chest, which shows the empyema cavity and the thickening or pleural cortex. When the empyema cavity was identified, a diagnostic thoracentesis guided by ultrasound was performed and the sample was sent for physiochemistry and culture. In all patients studied, the following was performed: Ultrasound-guided thoracentesis, uniportal video thoracoscopy, pleural cavity toilet, opening of visceral peel and preparation of SIVIC (Intracavitary Vacuum System). The type of anesthesia used was sedation and local anesthesia in 8 patients and general anesthesia in 5 patients: 2 with intubation or selective and 3 with orotracheal tube. All patients were positioned in lateral decubitus position and subsequently ultrasound marking of the collection was performed. (Figure 1) A minimum thoracotomy of 1.5 cm was performed after ultrasound marking of the collection (Figure 2) and the contents were aspirated.

Figure 1: Tomography, ultrasound identification of pleural collection and subsequent thoracentesis.

Figure 2: Minimal thoracotomy and aspiration of purulent secretion.

Uniporter video thoracoscopy is performed with 10 mm and 30-degree optics and subsequent pleural toilet (Figure 3). Secretions are aspirated, waste is removed, such as fibrin and purulent material and exhaustive washing and drainage until the cavity is clean. No attempt is made to perform decortication. Subsequently, the pleural peel is identified as a result of the infectious condition that makes lung expansion impossible and it is opened with a low-intensity electro scalpel (Figure 4), making parallel incisions, with delicate movements so as not to injure the pulmonary visceral pleura and prevent bleeding and air leak. Subsequently, the SIVIC is made, introducing high-density foam rubber to the connected cavity and covering all the fenestrae of a pleural drainage, and in this way the negative pressure can be distributed homogeneously over the entire cavity (Figure 5). The drainage is fixed to the skin and hermetic healing is carried out so that it can later be connected directly to aspiration with a pressure of -85 to -125 mm/hg (without two-tubed bottle). In the postoperative period, 7 patients went to the general room and 6 patients to a closed area for monitoring, all in a awake state without complications related to the type of anesthesia.

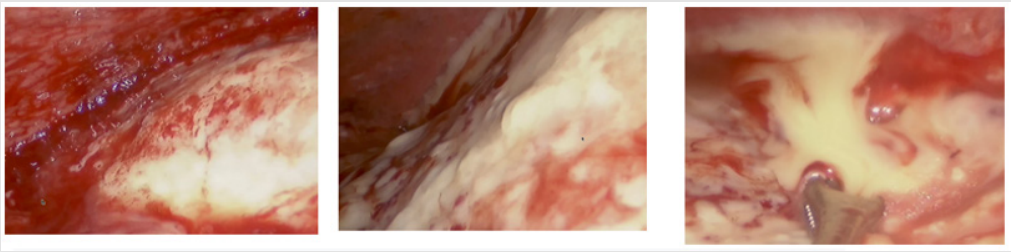

Figure 3: Video thoracoscopy showing empyema cavity with remains of fibrin and pus.

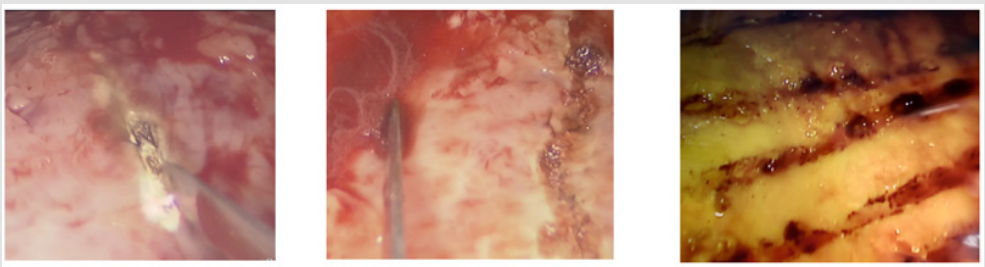

Figure 4: Identification of the pleural peel that makes lung expansion impossible. Longitudinal incisions are made with electro scalpel at low intensity.

Figure 5: Preparation of SIVIC with foam rubber, introduction into the cavity and hermetic curing.

Based on the clinical and radiological evolution of the patients in the postoperative period, the SIVIC system was replaced between 5 and 7 days postoperatively in the patient's bed with sterile technique and local anesthesia. 6 patients needed only 1 replacement 1 patient underwent 2 replacements of the SIVIC system in 6 patients no replacement was necessary. The total duration of SIVIC was between 5 to 17 days, with an average time of 9 days. All patients received antibiotic treatment between 7 to 10 days depending on the bacterial development in the corresponding cultures.

Results

The main objective of treatment with video thoracoscopy and SIVIC, defined as the resolution of the infectious condition, was widely achieved, since all the treated patients (N;13) had total resolution of their infectious condition, with normalization of the thermal curve and biochemical parameters. and with complete drainage of the empyema cavity without the need to use another complementary surgical procedure. The decontamination and sterilization of the cavity produced by the intracavitary vacuum system, added to the video thoracoscopic toilet, constituted a decisive factor for the closure of said cavity, the which was completed, in 76.9% of the treated cases (10/13 patients), at the time of discharge (Figure 6) No complications related to negative pressure were observed. The follow- up of the patients was prolonged until the third month post drainage, verifying total closure in all patients, without residual collections. Cavitary closure, added to the absence of surgical mortality, were the secondary objectives achieved by our experience. The management of the pain produced during the use of the vacuum system was carried out adequately with opioids and common analgesics, leaving all patients without chronic pain in the long-term follow-up. There were no complications inherent to the described procedure.

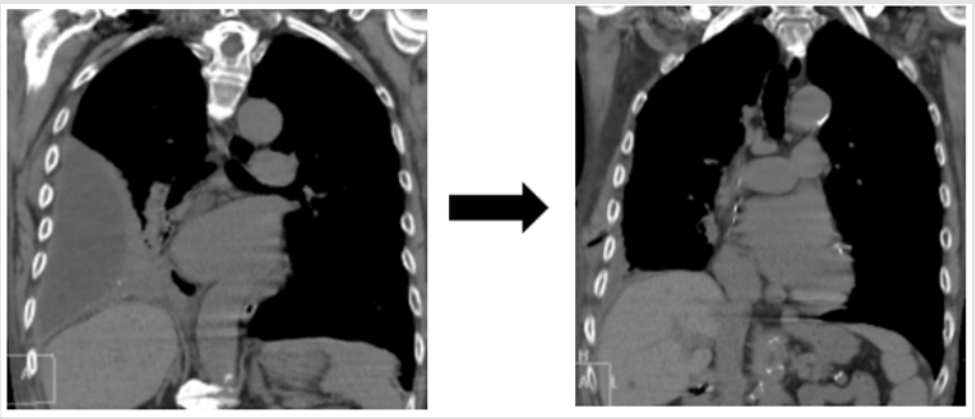

Figure 6: Occlusion of empyema cavity post SIVIC.

Discussion

The treatment of chronic empyema continues to be a great challenge for every thoracic surgery team globally, aggravated by the increasing incidence in the world population [1,2,4], especially in underdeveloped or developing countries such as Argentina. Pulmonary decortication currently continues to be indicated as a first-choice therapeutic Alternative [3,7,10], but it entails high morbidity and mortality close to 40% [2,8]. In patients who do not tolerate decortication due to age or comorbidities, thoracostomy is indicated, which produces permanent parietal sequelae [1,7]. In those patients in whom the persistence of a post-decortication or post-thoracostomy cavity that is usually suppurated is identified by images, a collapse therapy procedure is required, such as cavity myoblast or thoracoplasty, which are even more bloody and mutilating than previously mentioned [4].

Faced with this complex reality that chronic empyema poses, where the increasing frequency of affected patients and surgical procedures with high morbidity and mortality are added to resolve it, the need arose to use an effective mini-invasive procedure with the aim of minimizing surgical trauma, achieving control of infection and closure of the cavity. This is how we combined and developed uniportal video thoracoscopy and the intracavitary vacuum system (SIVIC). Our experience is based on the use of video thoracoscopy to approach the empyematic cavity, which allows an inspection and toilet with profuse washing and extraction of fibrin and infected tissue remains, added to the section of the pleural cortex with multiple cuts to break the shell. that imprisons the lung and favors its re-expansion. Added to this entire procedure is the placement of a sponge attached to a pleural drain, which is connected to a continuous aspiration system. This entire technique has the enormous advantage that it can be performed with local anesthesia and sedation, which avoids general anesthesia and all its complications, and can thus be indicated for a greater number of patients, whether elderly or with comorbidities.

The initial experience is extremely encouraging in relation to the resolution of the infectious condition and the closure of the cavity, although there is a small number of patients to be able to affirm that we are facing a paradigm shift in the treatment of chronic empyema. Both decortication and thoracostomy are centuries-old procedures that are part of the therapeutic arsenal of pleural empyema and have proven effective over time, but they are performed under general anesthesia, present severe complications, considerable mortality and parietal sequelae. Uniporter video thoracoscopy and intracavitary vacuum system (SIVIC) can be performed with local anesthesia, can be performed by personnel with moderate videoscope training and does not require sophisticated instruments. The evidence derived from our short experience shows us that this mini-invasive procedure is feasible, effective and safe, even in patients at high surgical risk. Although larger randomized trials are required to validate this treatment option, all the evidence collected by our initial experience shows us the high potential of this technique to position itself as a first-choice surgical alternative in the arsenal. therapeutic against chronic pleural empyema.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2026.64.010036

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Submission Link: https://biomedres.us/submit-manuscript.php