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ORIGINAL ARTICLE

# Surgical closure of patent ductus arteriosus in premature neonates: Does the surgical technique affect the outcome?☆

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**KEYWORDS**
Patent ductus arteriosus;
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**Abstract**
*Introduction:* Surgical closure of patent ductus arteriosus in premature neonates is an aggressive technique and is not free of complications. A study was designed with the aim of describing our experience with a less invasive technique, the extra-pleural approach via a posterior minithoracotomy, and to compare the results with the classic transpleural approach.
*Patients and methods:* A retrospective cohort study was conducted on premature neonates on whom surgical closure of the ductus was performed during a ten-year period (March 2005 to March 2015). A comparison was made of the acute complications, the outcomes on discharge, and follow-up, between the extra-pleural approach and the classic transpleural approach. The study included 48 patients, 30 in the classical approach and 18 in the extra-pleural group.
*Results:* The demographic and pre-operative characteristics were similar in both groups. No differences were found between the 2 groups in the incidence of acute post-operative complications (56.6 vs. 44.4%), on the dependence on oxygen at 36 weeks (33.3 vs. 55.5%), or in hospital mortality (10 vs. 16.6%). As regards the short-term progress, the extra-pleural group required fewer days until the withdrawal of supplementary oxygen (36.3 vs. 28.9) and until hospital discharge (67.5 vs. 53.2), although only the time until extubation achieved a statistically significant difference (11.5 vs. 2.7, $p = .03$).

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*Conclusions:* The extra-plural approach by posterior minithoracotomy for the surgical closure of ductus in the premature infant is viable and could bring some clinical benefits in the short-term.


**PALABRAS CLAVE**
Ductus arterioso persistente;
Prematuro;
Cirugía cardiaca

**Cierre quirúrgico del ductus arterioso persistente del prematuro: ¿influye la técnica quirúrgica en los resultados?**

**Resumen**
*Introducción:* El cierre quirúrgico del ductus arterioso persistente en el prematuro es una técnica agresiva y no exenta de complicaciones. Diseñamos un estudio con el objetivo de describir nuestra experiencia con una técnica menos invasiva, el abordaje extrapleural vía minitoracotomía posterior, y de comparar sus resultados con los del abordaje clásico transpleural.
*Pacientes y métodos:* Estudio de cohortes retrospectivo de los neonatos prematuros a los que se les realizó cierre quirúrgico del ductus en un periodo de 10 años (marzo de 2005-marzo de 2015). Se compararon las complicaciones agudas, los resultados al alta y en el seguimiento entre los grupos de abordaje extrapleural y abordaje clásico transpleural. Se incluyó a 48 pacientes, 30 en el grupo de abordaje clásico y 18 en el grupo extrapleural.
*Resultados:* Las características demográficas y preoperatorias fueron similares en ambos grupos. No se encontraron diferencias entre los 2 grupos en la incidencia de complicaciones postoperatorias agudas (56,6 vs. 44,4%), en la dependencia de oxígeno a las 36 semanas (33,3 vs. 55,5%), ni en la mortalidad hospitalaria (10 vs. 16,6%). En la evolución a corto plazo, el grupo extrapleural precisó menos días hasta la retirada del oxígeno suplementario (36,3 vs. 28,9) y hasta el alta hospitalaria (67,5 vs. 53,2), aunque solo el tiempo hasta la extubación alcanzó una diferencia estadísticamente significativa (11,5 vs. 2,7, p = 0,03).
*Conclusiones:* El abordaje extrapleural por minitoracotomía posterior para el cierre quirúrgico del ductus en el prematuro es factible y podría conllevar algunos beneficios clínicos a corto plazo.


## Introduction

Patent ductus arteriosus (PDA) is very prevalent in preterm newborns: it is found in 30% of those born at less than 30 weeks' gestation and more than 60% of those born at less than 28 weeks' gestation.[1] The treatment approaches that are currently available are: (1) conservative treatment, (2) pharmacological treatment with cyclooxygenase inhibitors and (3) surgical repair.[2,3] Although there is variability in treatment protocols and some degree of controversy on many aspects related to the management of PDA, surgical repair is usually reserved for patients in whom pharmacological treatment is ineffective or contraindicated. Surgery is a fairly aggressive intervention in patients as fragile as preterm infants, and is not free of significant complications. Furthermore, in recent years concerns have been raised concerning the potential deleterious effects of surgical closure on respiratory and neurologic outcomes.[2] Thus, there is still no consensus in the medical community on the indications for surgical closure or the optimal time window for its performance.[1,4–6] In this context, technical modifications aimed at reducing the aggressiveness of surgical intervention are particularly appealing. Approaches that are supposedly less invasive have been developed, such as video-assisted thoracoscopic surgery,[7,8] percutaneous closure with different devices,[9] posterior minithoracotomy,[10] transversal cervicotomy[11] and extrapleural (EP) ligation.[10,12,13] The latter offers potential advantages compared to the classic transpleural (TP) approach: (1) excellent visualisation of the PDA and associated structures, including the recurrent laryngeal nerve, (2) preservation of the integrity of the pleural space and (3) does not require insertion of a chest tube.[10,12,13] The EP approach has been associated to shorter operative times and some clinical benefits,[10,12,13] but to our knowledge there have been no studies comparing it to the classic TP approach in the management of PDA in preterm infants.

The aim of our study was to describe our experience in the surgical management of PDA and to compare the outcomes of the classic TP approach with those of the new EP approach with posterior minithoracotomy.

## Patients and methods

We conducted a retrospective observational cohort study, including all preterm infants that underwent surgical closure of PDA between March 2005 and March 2015. We excluded patients that underwent PDA ligation as part of a more complex surgical repair and those that had surgery after