



Profound Bradycardia following Patent Ductus Arteriosus Closure; A Rare but Correctable Event

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▶ ABSTRACT

Proximity of the vagus nerve to a patent ductus arteriosus (PDA) can cause traction or entrapment of vagus nerve during surgical closure of the in rare occasions. This can lead to a life threatening postoperative bradycardia. Herein, we report a case of bradycardia caused by unexpected irritation of the vagal trunk by the end of operation. The patient was managed by re-opening the chest, lung retraction and removal of mediastinal pleura sutures. The vagal trunk entrapped in the suture line was released immediately. Heart rate accelerated and hemodynamic restored after a short period of observation. The operation terminated as routine, patient extubated in OR and discharged within 24 hours with no further complication. This irritation of vagus results in vagal bradycardia during or by the end of operation. Awareness of a surgeon of this issue can minimize the risks and complications of the open closure of PDA.

Keywords: Patent ductus arteriosus; Vagal bradycardia; Surgery; Congenital heart disease.

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Introduction

Patent ductus arteriosus (PDA) is one of the most common congenital cardiac diseases which occurs in 1 in 2,000 live births [1,2]. The factors responsible for persistent patency of the ductus arteriosus beyond the first 24 to 48 hours of neonatal life are not completely understood. Prematurity clearly increases the incidence of PDA, and this is due to physiological factors related to prematurity rather than inherent abnormality of the ductus [3]. In term infants, cases most often appear to occur sporadically, but there is increasing evidence that genetic factors play a role in many patients with PDA. In addition, other factors such as prenatal infection appear to play a role in some cases.

PDA closure is clearly indicated for any child or adult who is symptomatic from significant left-to-right shunting through the PDA. In asymptomatic

patients with significant left-to-right shunting which results in left heart enlargement, closure is indicated to minimize the future risk of complications [4]. Elimination of the shunt reduces pulmonary blood flow, and therefore pulmonary artery pressure, even if the pulmonary vascular resistance remains elevated [5]. The closure may be done by interventional device closure, thoracoscopic method and thoracotomy or open approach to anatomical site and direct closure [6]. Open surgery for PDA closure has low duration; low risk operation that commonly carries low risk of complications [7]. We report a rare complication of an open PDA closure with bradycardia developing subsequent to stimulation of the vagal trunk during or after the operation.

Case report

A 2-year-old girl with PDA was admitted to our

hospital cath lab for device closure of the PDA. Aortography in lateral view showed moderate sized PDA. Cardiologists tried to close the ductus by two different sized PFM coils (9*6mm and 7*6mm) but high flow of blood through the ductus failed the procedure and both coils were drawn out. The patient was taken to operating room the following day. Under general anesthesia in right decubitus position, after preparation and drape through standard left posterolateral skin incision left pleural space was entered via 4th interspace. After retraction of left lung downward by small wet sponge, the proper anatomical site of PDA including distal arch and proximal descending aorta was exposed. An area of echymosis noted in ductal region, adjacent to aorta which could be due to manipulation and instrumentation of the ductus in the cath lab. The superior lying mediastinal pleura opened longitudinally and the exposed ductus was cut between the clamps and was occluded by two non-traumatizing clamps divided between two non-traumatizing clamps. Both cut edges of ductus sutured by 5.0 prolene in two rows and ductal clamps removed. Hemostasis done, field irrigated and the open mediastinal pleura approximated with 5.0 prolene suture continuously. Small bore catheter inserted and lung was inflated. While approximating the ribs, heart rate dropped from 130bpm to 40-50bpm and blood pressure reduced from 90mmHg to 40mmHg. The rib re-approximation stopped immediately. Chest re-opened, lung retracted and mediastinal pleura sutures removed. The vagal trunk found to be entrapped within the suture lines and was released immediately. Heart rate accelerated and hemodynamic restored after a short period of observation. The operation terminated as routine, patient extubated in OR and discharged within 24 hours with no further complication.

Discussion

Patent ductus arteriosus is one of the common congenital cardiac defects which can cause pulmonary hypertension with subsequent heart failure if not closed [8]. During past three decades, device closure

of a PDA has greatly developed and various devices and methods have been introduced to minimize the need for open surgical interventions. But in some large PDA cases, and when less invasive attempts of PDA closure fail, open closure is still the only viable option [9]. Although generally associated with greater pain and morbidity than transcatheter methods, surgical ligation and surgical division are safe and effective procedures that historically have set a high standard by which transcatheter techniques are judged. Surgical ligation or division of the PDA remains the treatment of choice for the rare very large ductus. Rarely, a large, window-type PDA may have insufficient length to permit ligation, and thus the appropriate surgical procedure is patch closure on cardiopulmonary bypass [10]. Complete closure rates of surgical ligation, often accompanied by division of the ductus in published reports range from 94% to 100%, with 0% to 2% mortality [11-13]. Important complications include bleeding, pneumothorax, infection, and rarely, ligation of the left pulmonary artery or aorta. Surgical morbidity, cost, and the length of hospitalization have decreased by performing transaxillary muscle-sparing thoracotomy [14,15] and by the technique of video-assisted thoracoscopic ligation of the PDA [16]. Open PDA closure surgery is done by visualizing the anatomical field of the ductus and ligation or clamping and division of the ductus [17]. In some cases with previous instrumentation of the ductus, the adventitial layer of the ductus and surrounding area can be severely echymotic due to irritation of the ductal intima, causing inappropriate field visualization.

Since the ductus arteriosus is adjacent to the vagal trunk, any irritation of the vagus nerve can be made by retraction efforts, or very rarely when the surgeon applies sutures that can entrap the vagus. This irritation of vagus results in vagal bradycardia during or by the end of the operation. Awareness of a surgeon of this issue can minimize the risks and complications of the open closure of PDA.

Conflict of Interest: None declared.

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