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ORIGINAL PAPER

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The effectiveness of octreotide in the treatment of post-operative chylothorax

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Abstract Chylothorax may be spontaneous or a complication of thoracic surgery. Treatment of this potentially harmful condition is not well established and may comprise dietary interventions and surgery. Somatostatin seems effective in the management of chylothorax, although its mechanism of action is unclear. *Conclusion:* octreotide, a somatostatin analogue, may be effective in the treatment of post-operative chylothorax.

Keywords Chylothorax · Congenital heart defects
Heart surgery · Octreotide · Somatostatin

Introduction

Chylothorax, the accumulation of chylous drainage in the pleural space, may be a rare complication of paediatric thoracic surgery, trauma, superior caval vein hypertension, or it may be "spontaneous" (particularly in neonates) [1, 3, 11]. This condition may have deleterious effects on the nutritional and immunological state of the patients. Usually, if the chylous effusion does not resolve with a nutritional approach, direct ligation of the thoracic duct, pleurodesis, or placement of pleuroperitoneal shunts are performed [1]. However, surgery itself carries significant risks. Some authors have described the effectiveness of somatostatin in the treatment of post-operative chylothorax [6, 9, 10]. We report our experience with chylothorax in surgical patients.

Case reports

In the last 10 years in our Department, six patients developed chylothorax as a complication of heart surgery. In all the patients the chylothorax was not due to a state of venous hypertension. The fluid drained early from the chest tubes was clear but, 1 to 2 days following the start of normal oral feeding, it became milky. The concentration of triglycerides in the fluid was >110 mg/dl. Fluid losses ranged from 125 to 400 ml/24 h.

The first four patients were treated conservatively by maintenance of the chest tubes and switching to a diet enriched in medium-chain triglycerides (Portagen, Mead-Johnson, Rome; Caprilon, Nutricia, Milan, Italy). After a mean of 3 days, due to the persistence of the chylous drainage, three of the four patients were started on total parenteral nutrition. After a mean of 13 days (range = 9–18 days) of total parenteral nutrition, three of the four patients underwent surgical suture of the thoracic duct. In the 4th patient, chest tubes could be removed without surgery after 9 days. Patients were discharged after a mean post-operative stay of 25.5 days (range = 18–39 days).

Two other patients presented with chylothorax, draining a mean of 100 ml/24 h of fluid. Oral intake was limited only to Portagen, but this did not substantially alter the chylous drainage. On the 4th and 6th post-operative days, respectively, continuous infusion of octreotide, a long-acting analogue of somatostatin, was started. The initial dose was 0.5 μg/kg per h, increasing to 1 μg/kg per h. After 48 h of treatment, the chylous drainage had virtually ceased and the chest tubes could be removed on the 10th post-operative day in both patients. Octreotide infusion was then tapered and stopped after 7 days. The two children were discharged 15 and 13 days after surgery, respectively. No side-effects of the treatment were observed.

Discussion

Chylothorax is rare in paediatrics with a reported incidence of 0.25% to 2.5% [1, 2, 4, 8, 12]. The lymph drained from the splanchnic bed is rich in triglycerides, proteins, immunoglobulins, and lymphocytes, and this exposes patients to a significant burden of immunological and nutritional risks. Moreover, additional risks may come from repeated surgery. The usual therapeutic approach aims to reduce the production of lymph by minimizing oral fat intake. Medium-chain triglycerides are added to the diet because they avoid the intestinal lymphatic network. If this approach fails, total parenteral nutrition is introduced, eventually followed by surgery [11]. Major complications reported during the conservative management are systemic or wound infections and growth retardation. [1].

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Several authors have described their own experience with chylothorax. Cerfolio et al. [4] described 47 adults, with 34 patients undergoing surgery. One patient died and 18 had a complicated course. Bond et al. [2] reported spontaneous resolution of the effusion by dietary interventions in 19/26 patients. Similar results have been reported by Verunelli et al. [12] in 11 children and by Nguyen et al. [8] in 21 out of 24 patients. More recently, Beghetti et al. [1] outlined a practical therapeutic algorithm, suggesting an initial trial with a medium-chain triglyceride diet for 1 week, followed by parenteral nutrition for 3 additional weeks. This approach was effective in 80% of the patients [1]. Searching for an alternative treatment, Ulibarri et al. [10] treated an adult with a continuous infusion of somatostatin for 12 days. The lymph drainage ceased within 5 days of therapy. Subsequently Rimensberger et al. [9] treated an infant with a continuous infusion of somatostatin and Kelly and Shumway [6], an older patient with subcutaneous somatostatin, achieving complete resolution of the drainage. Finally, Cheung et al. [5] recently reported the successful treatment of two children with subcutaneous octreotide.

In our Department, the incidence of chylothorax is 0.3%. The first four patients were treated conservatively and three, eventually, underwent surgery. In one patient only the conservative approach was successful. Two other patients were treated with octreotide, a synthetic analogue of somatostatin. Chylous drainage ceased by 48 h, allowing us to remove the chest tubes sooner and to discharge them earlier than the other four patients. No side-effects of the treatment were noted. Although these limited numbers do not allow a statistical conclusion, the prompt response in our children is very encouraging, considering also that neither patient treated with octreotide required parenteral nutrition.

No controlled, randomised studies are available on the use of somatostatin (and its analogues) in the treatment of chylothorax except for the recent report by Markham et al. [7] on the effectiveness of subcutaneous octreotide after direct damage of the thoracic duct in the dog. The mechanism of action of somatostatin is not clear, although a direct effect on the splanchnic lymphatic flow has been proposed. Markham et al. [7] found no difference in the composition of the drained fluid between treated and control animals, in contrast to the findings of Cheung et al. [5]. In our patients, octreotide reduced the concentration of triglycerides in the fluid. We suggest that, despite the uncertainty about its mechanism of action, octreotide may be useful in the treatment of post-operative chylothorax in infants and children. Octreotide can be administered either intravenously or subcutaneously, and this could be more advantageous, compared to somatostatin, which requires continuous intravenous infusion. Such an approach may reduce patient discomfort, and shorten hospital stay, also contributing to cost containment. However, if one considers that the lymphatic vessels are unable to contract effectively and their flow is driven by extrinsic forces, it is likely that only mild to moderate forms of chylothorax can benefit from this treatment [11] whereas in patients losing large volumes of fluid, octreotide alone may not be able to reduce the lymphatic flow enough to promote healing of the ruptured vessels. Nevertheless, also in these patients, a trial with octreotide together with total parenteral nutrition might be useful before considering surgery. Future experimental studies should try to clarify the mechanism of action of somatostatin and its analogues.

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