The anterior mediastinum is the most common site for thoracic tumors in pediatrics. Benign and malignant lesions include various tumors, most frequently lymphomas. The histological diagnosis obtained by biopsy is the most important determinant for the further treatment.

Introduction of a known biopsy method – the Chamberlain procedure in our institution has been commenced as one of the methods for obtaining tissue samples of the anterior mediastinal masses.

An anterior mini thoracotomy in the 2nd or 3rd intercostal space gives an excellent approach to the tumor.

Three children were operated by this method. The volume of three obtained tissue samples was sufficient for the pathologist and gave a 100% accurate diagnosis.

The Chamberlain mini anterior thoracotomy is a good biopsy operative method. It can be used in hospitals which do not have endoscopic thoracic equipment or trained endoscopic surgeons, it is easy to perform and gives comfort to the anesthesiologist.

Key words: Chamberlain procedure, pediatric, mediastinal mass.

INTRODUCTION

Although mediastinal tumors are not frequent in the pediatric population, the anterior mediastinum is the most common site for thoracic masses in children. They include benign and malignant lesions originating from the thymus or the thyroid gland, teratomas, dermoid cysts, mesenchymal tumors, cystic hygromas, and most frequently lymphomas (Hodgkin and non-Hodgkin). Contemporary imaging methods (X-ray, ultrasound, computed tomography, nuclear magnetic resonance) can accurately delineate the size, position and propagation of the tumor, but it is the tissue sample which gives the diagnosis on which the treatment is indicated. Anterior mediastinal masses are challenging for the anesthesiologist as most of them produce various degrees of superior mediastinum compression syndrome - airway obstruction or shifting of the great vessels with/without superior vena cava obstruction.

Obtaining a tumor tissue sample can be done by a percutaneous method (needle tissue biopsy or needle aspiration of the thoracic or pericardial fluid), mediastinoscopy, thoracocentesis, transthoracic methods (open biopsy), pericardiocentesis and thoracoscopic methods (VATS - Video Assisted Thoracoscopic Surgery). Some of these techniques like mediastinoscopy and needle tissue biopsies are most oftenly reserved for the adult population.

The Chamberlain procedure, originally described in 1966, is a rarely used and described in the literature concerning pediatric patients with thoracic masses. It includes a transversal limited left or right anterior thoracotomy for biopsy of the anterior mediastinal masses which are out of reach to the surgeon except via classical lateral thoracotomy. It can be done in general or local anesthesia and/or analgo-sedation, with/without epidural analgesia, with spontaneous breathing or endotracheal intubation. A short parasternal incision is done over the 2nd or 3rd intercostal space. The subcutaneous tissue, pectoralis major muscle and intercostal muscles are divided after which the entry and access into the anterior mediastinum is achieved. This is particularly convenient in the small children where the subcutaneous and thoracic muscular tissue are not fully developed. Thoracic drainage is only necessary if the pleural cavity is opened. In older pediatric patients and adult patients, extension of the
incision laterally (extended Chamberlain minithoracotomy) can provide space for larger resection.

MATERIALS AND METHODS:

We have analyzed the cases where an anterior Chamberlain limited thoracotomy was done in order to obtain a biopsy of the tumor. In the last 5 years a total of 67 patients with thoracic masses were operated of which 43 were located in the anterior mediastinum (64.17%). 22 patients had a lymph node biopsy (neck), 15 had an open thoracotomy which resulted in mass biopsy in 8 patients and complete mass extirpation in 7 patients. One child had an abscessus mistaken for a tumor which was drained, one patient had a rib biopsy, whilst the third had an incomplete diaphragm paralysis which was mistaken as a thoracic mass and therefore complicated. One child had a VATS procedure for mass and lung biopsy. Three children had a biopsy via the Chamberlain anterior limited thoracotomy.

RESULTS:

On the total scale an accurate diagnosis was made in 31 children (72%). Four different surgeons were involved in the surgical procedures and only one applied the Chamberlain procedure. Tissue samples obtained in three children (6.97%) were inadequate for pathological analysis. Two were attempted lymph node biopsies and one a tumorous mass biopsy. Paradoxically, it was obtained through a thoracotomy and turned to be a cystic hygroma after the second biopsy attempt. Seven out of 22 children who had lymph node biopsies were diagnosed with lymphadenitis (16.2%) and 11 were diagnosed as lymphomas (50%). Four children had histological results of a normal lymph node. Twelve children had a complete in toto tumor extirpation (27.9%). Ten children who had a thoracotomy for solely diagnostic reasons had the chest drainage for an average of 5.7 days (3 days to 11 days). The drains were removed when the drainage was less than 1ml/kg/day. Mediastinoscopy was never performed in our institution. The duration of the VATS procedure was more than 3 hours. The Chamberlain biopsy was performed in three children aged 13, 9 and 17 years who had evident anterior masses diagnosed by X-ray and computed tomography. All three procedures were performed under general anaesthesia, two with spontaneous ventilation, one child was intubated. Two children had clinical signs of superior vena cava syndrome obstruction, and one had severely compromised pulmonary reserve. One child had significant adhesions from previous surgery (pleurectomy post empyema three years before the biopsy). All samples were easily extirpated via the small opening (two left and one right mini anterior thoracotomy). No thoracic drainage was necessary. The samples were sufficient to give a 100% accurate diagnosis (Non Hodgkin lymphoma in two patients, malignant teratoma in one). There were no major complications. The total duration of the procedure with induction of general anaesthesia was 57 minutes, 59 minutes and 38 minutes. Only one child required opioid analgesia for pain management.

DISCUSSION AND CONCLUSION:

Although an operating technique dating from half a century ago, the Chamberlain limited anterior thoracotomy has not been widely used in the pediatric
population for obtaining biopsies of the anterior thoracic masses, and never previously in our institution. The urgency for rapid diagnosis, compromised clinical presentation of the children and high anaesthetic risks limit the optimal approach for obtaining the adequate tissue sample. Percutaneous needle biopsy had been proven to be insufficient in children because of frequent inadequate tissue samples. Lymph node biopsies can be misleading and require repeated surgeries. Thoracotomies are major surgical interventions which are indicated when tumor extirpations are considered. Thoracoscopic interventions require sophisticated equipment, highly trained personnel and are not available in major centres in Serbia. We have applied the Chamberlain limited anterior thoracotomy in three patients where the anterior mediastinal mass was in close relation with the anterior thoracic wall. The procedures were performed in less than an hour including the induction of anaesthesia and did not require thoracic drainage. The operative and postoperative course of the patients was uneventful and required minimal postoperative doses of analgetic drugs. The less important cosmetic result was also praised by the parents. All three samples were sufficient for the pathologist.

We are very encouraged with our initial results of the limited anterior thoracotomy described by Chamberlain. We plan to apply this surgical technique whenever an indication for a biopsy of an anterior mediastinal mass is required, when VATS is not available and especially in cases where lymphomas are feasible or large masses which can be reduced by chemotherapy or radiation therapy before surgical extirpations. This technique can be applied in pediatric surgery centres which do not have the thoracoscopy facilities, it is easy to perform and the postoperative course is expected to be shorter than in other procedures. In older, cooperative children local anaesthesia could be applied. Therefore, our feeling is that the Chamberlain operation can be revived as a diagnostic surgical technique.

SUMMARY

DA LI POSTOJI MESTO ZA CHAMBERLAINOVU PROCEDURU U DJAGNOSTICI PREDNJIH MEDIJASTINALNIH TUMORA KOD DECE?

Anteriorni mediastinum je najčešće mesto pojave tumora grudnog koša kod dece. Benigne i maligne lezije uključuju različite vrste tumora, najčešće se radi o limfomima. Histološka dijagnoza nakon biopsije je najvažnija determinanta daljeg lečenja.