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DESCENDING NECROTIZING MEDIASTINITIS

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SUMMARY – Descending necrotizing mediastinitis is a severe septic infection of the mediastinum, mostly resulting from an infectious process originating from the neck or oral cavity. The mortality rate associated with descending necrotizing mediastinitis remains high (>40%) in spite of the current medical and surgical treatment options. The disease may occur at any age and in either sex. Early diagnosis is of utmost importance to immediately initiate intensive antibiotic therapy or surgical intervention in case of the infectious process descent to the thoracic cavity. A patient with descending necrotizing mediastinitis, initially treated with antibiotic therapy followed by surgical intervention due to the disease propagation, is presented. Intraoperatively, a life threatening complication of the left venous angle erosion developed.

Key words: *Mediastinitis – etiology; Mediastinitis – diagnosis; Mediastinitis – therapy; Mediastinitis – surgery; Mediastinitis – complications; Case report*

Definition

Descending necrotizing mediastinitis (DNM) is an inflammatory process of the mediastinum, which may occur due to the development of primarily pathogenic bacterial organisms, opportunistic bacteria, mycobacteria, fungi, or even as a hyperimmune response to a previous infection[1]. DNM usually develops as acute dissemination of oropharyngeal or cervical inflammation with a high mortality rate (up to 55%), or may occur in a chronic form if it failed to be recognized and properly treated on time[2]. A part of these infections develop following trans-sternal operative procedures, while almost a half of mediastinitis cases occur as a consequence of pharyngeal perforation induced by iatrogenic (endoscopy, complicated intubation) or deliberate (suicide) causes. The lethal form of mediastinitis is due to the infection descent down the cervical fascia and areas such as pretracheal, buccopharyngeal, prevertebral fascia and pretracheal, perivascular space, or the area along carotid arteries and prevertebral area consisting of the retropharyngeal and danger space. It should be noted that a very severe form of mediastinitis occurs by the infection descent through the so-called danger space found between the alar and prevertebral fascia, and deep cervical fascia, extending from the skull base through posterior mediastinum down to the diaphragm. Most frequently, infections from the retropharyngeal space descend to this area. Infections located at the carotid bed and vagal nerve, so-called visceral vascular space, rarely show a tendency to descend to the mediastinum but cause problems at the local level, with frequent thrombosis of the internal jugular vein and erosions of the carotid artery. Almost 70% of infections disseminate through the prevertebral space, and some 10% through the pretracheal and visceral space.

Odontogenic abscesses of the second and third molars frequently tend to spread to the submandibular and parapharyngeal space; infection of the parotid gland infections may also extend to this area, wherefrom the way to the mediastinum is almost free. In rare cases, a suppurative process may disseminate from the abdomen through the hiatal orifice on the diaphragm to the posterior mediastinum.

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The bacterial flora found in these infections usually consists of anaerobes and aerobes, so that the joint action of one or more species of gram-negative microbes and anaerobes leads to the synergistic effect with the formation of necrotizing cellulitis[3].

Clinical Picture

Endo *et al.* have proposed a classification of DNM according to localization of suppurative content: type I – abscess localization in upper mediastinum, above tracheal bifurcation; type IIA – spread to anterior lower mediastinum; and type IIB – spread from the neck into the anterior and posterior lower mediastinum[4].

The symptoms that occur at the onset of the disease generally include local signs in the oral cavity and on the neck in the form of edema, skin and mucosa redness, pain, elevated temperature, and poor general condition. Crepitations may occasionally be palpated due to air accumulation in cervical subcutaneous tissues and upper hemithorax, while dyspnea and sternal pains with occasionally difficult swallowing occur as a sign of the inflammation descent to the mediastinum. These discomforts usually occur some 12-48 hours of the disease onset, however, they may also occur several days or even weeks later. Dissemination of the inflammation to the pericardium or pleural space results in nonspecific cardiac events and irritative coughing or respiratory insufficiency[5].

Diagnosis

Diagnosis is made by clinical examination and radiological studies including lung x-ray in anteroposterior profile and contrast enhanced CT of the neck, thorax and abdomen. There are a number of typical signs which are, according to Estrera *et al.*, suggestive of the development of DNM: 1) clinically, the presence of a serious oropharyngeal infection; 2) a characteristic radiological finding; 3) verification of a necrotizing mediastinal process intraoperatively or on autopsy; and 4) establishment of association between the two inflammatory processes. Lung x-ray shows some characteristic findings: enlargement of the retrocervical space with or without aeroliquid collection; forward migration of the tracheal air column; mediastinal emphysema; and loss of cervical lordosis. Effusion into the pericardium and pleural space is often found in addition to these signs. CT reveals edema of the mediastinal adipose tissue with the loss of clear margins, aeroliquid levels or a large liquid substrate of the neck and mediastinum with pleural or pericardial effusion[6].

Treatment

Treatment usually begins with combined antibiotic therapy for aerobes and anaerobes, which is subsequently corrected according to the bacteriological report and suppurative collection antibiotic sensitivity report. This is followed by aggressive operative therapy with left or right cervicotomy or collar incision. When the processes are exclusively localized on the neck, these incisions with placement of Penrose drains are sufficient, however, if collections are localized in the anterior mediastinum, blunt opening of the retrosternal space above and below the sternum through collar incision and subxyphoid incision is necessary. Pus evacuation, abundant rinsing and drainage of the incised regions with repeat daily dressing frequently lead to a satisfactory outcome.

Collections localized in posterior mediastinum have to be evacuated by posterolateral thoracotomy with extensive opening of mediastinal pleura, and connection of all spaces and collections with debridement and excision of necrotic tissue. The operative procedure is completed with abundant rinsing of the thorax and placement of one or more wide-lumen drains for rinse flow. Thorax rinsing is recommended to perform 1-2 times daily with 1000-2000 mL saline to which a half of Rivanol solution can be added. The chest side to be opened depends on mediastinal reaction and localization of pleural effusion. Drains are left in place until the resolution of suppurative collection (with occasional control chest CT) or negative bacteriological finding of pleural effusion.

Anterior or posterior mediastinotomy with extrapleural access to suppurative collection of posterior mediastinum is less frequently performed, whereas VATS is generally reserved for experimental purpose[7]. Some authors advocate tracheotomy and placement of a cannula to prevent respiratory discomforts, whereas others recommend it to perform when really necessary but not in the initial stage of the disease[8].

Results

Acute mediastinitis is still associated with a very high mortality rate in spite of the great number of antibiotics and advanced surgical technique available. Some authors report on a 40% lethality in case of delayed diagnosis

and inappropriate treatment[6], whereas lately this figure can, according to some authors, be reduced to 23% provided early aggressive antibiotic and operative therapy has been timely introduced. However, most favorable results can definitely be only achieved by extensive neck incisions with drainage of cervical spaces, associated with posterolateral thoracotomy with necrectomy, debridement and thoracic drainage with multiple drains[9].

Case Report

On February 13, 2001, Lj. B., a man born in 1947, graduate mechanical engineer, married, blessed with two children, from Bjelovar, Croatia, was transferred as an emergency from Bjelovar Hospital for clinical and radiological signs of DNM. There was no previous severe disease in his personal or family history. The patient reported allergy to penicillin. Three days before his presentation to the Bjelovar Hospital, he visited his physician for elevated body temperature and pains in the left side of his face and neck, who prescribed him an antibiotic. As the symptoms progressed, accompanied by elevated temperature and difficult mouth opening, he was admitted to ENT Department on February 4, where he was administered penicillin and Solu-Medrol. On the next day, edema of the left palatal arch and oral cavity floor developed, with crepitations and edema of the skin of the neck. On February 6, incision of the oral cavity floor with incision of the neck skin below the left mandibular angle was performed, whereby a considerable amount of thick pus was collected. The antibiotic sensitivity report pointed to *Peptostreptococcus* spp., and therapy with Dalacin 4x600 mg and Medazol 3x500 mg was introduced. Upon incision, the patient turned afebrile, however, elevated temperature recurred on February 11. Now, penicillin was introduced in therapy, resulting in malaise and vertigo; then the patient was switched to garamycin 2x120 mg. On February 13, CT of the neck and thorax revealed a phlegmonous edema of the oral cavity soft tissues on the left, left side of the neck with aeroliquid collections, and of anterior upper mediastinum. Minor basal pleural effusions were bilaterally observed and the patient was transferred to University Department of Thoracic Surgery, Jordanovac University Hospital for Lung Diseases in Zagreb.

On admission, the patient was hardly mobile, conscious, body temperature 38.8 °C, exhibiting tachypnea and tachycardia, with cyanotic extremities, and dry and warm skin; visible redness and skin edema with crepitations on the left side of the neck to the clavicle, with thick purulent content trickling along the drain from the incision under the left mandibular angle. His oral cavity was free from overt pathologic finding except for the scar left after the incision of the oral cavity floor on the left. On the lungs, diffuse light, weakened breathing bilaterally, especially at the bases; cardiac action rhythmical; tachycardia; no murmurs. The abdomen was soft, painless; the liver and spleen were not enlarged; the extremities were free from edema and with normal pulsation.

The patient was admitted to the Intensive Care Unit (ICU), where blood samples were obtained for all laboratory tests. Findings: L 22,000; mildly elevated urea and transaminases; tachycardia up to 130; normal blood pressure and urination; massive bacteria in urinary sediment. The ENT specialist on duty (Professor Bumber) was consulted. He considered that the subangular incision performed was not adequate, therefore left-sided cervicotomy and collar incision with evacuation of large amounts of suppurative content from the neck and anterior upper mediastinum were done, followed by abundant rinsing with antiseptic solution, preceded by sampling for bacteriology and ABG. The incisions were left open, loosely filled with gauze soaked in Betadin. Some 500 mL of thick suppurative effusion were obtained by drainage of the left thorax. Postoperatively, the patient woke normally, without temperature elevation, and spent the night uneventfully; he was extubated after 3 hours, with normal saturation, blood pressure and CVP. The image of the lungs was nearly normal, with only a minor effusion into both bases and normal drain position.

On the next day, dressing was changed on several occasions; there was minimal discharge by thoracic drain; right-sided puncture produced no pus but only a minimal sanguinolent discharge. Laboratory findings indicated mild anemia with L decrease; normal urination; however, melena occurred on February 15, and failed to respond to antiulcerative therapy, therefore the patient was referred to Department of Interventional Gastroenterology, Zagreb University Hospital Center. The patient refused gastroscopy and was returned to ICU where he was administered parenteral therapy and infusions, and transfusions of packed red blood cells (RBC); thoracic drain was corrected, with additional evacuation of effusion from the thorax. During the next three days, melena resolved, and on the next day a drain was also placed in the right thorax for effusion accumulation, to produce 200 mL of sanguinolent effusion. The patient

was afebrile, with normal laboratory findings, and dressing was changed on a daily basis. The antibiotic sensitivity report from the neck wounds showed *Staphylococcus epidermidis, Haemophilus parainfluenzae, Streptococcus haemolyticus.* The image of the lungs was normal, and the patient was transferred to the ward on February 23, with valvular drains, good general condition, and on antibiotic therapy according to the antibiotic sensitivity report.

After daily dressing exchange, the wound on the neck was cleaned from coagula in short i.v. anesthesia on February 27, which was followed by massive bleeding in the dressing room, stopped with a finger. The patient was intubated and immediately taken to the operative theater, where an additional incision on the skin of the neck was done across the clavicle, extending along the left side of the sternum to the level of the third rib and laterally above the mammilla. Then, the clavicle was resected, the pectoral muscle was separated from the support and the second rib was resected, thus performing the 'trap door' incision. The jugular vein angle, destroyed by the suppurative process, was accessed and sutured, and so were the internal jugular vein and left subclavian vein. The patient was transferred to ICU again, where anemia was corrected; the findings indicated hypoproteinemia and electrolyte dysbalance; Isoptin 3x80 mg and Lasix pp were introduced. Ultrasonography (US) of the heart showed a minimal pericardial effusion; normal urination, normal gas analysis and blood pressure. Lung x-ray showed a slightly extended upper mediastinum and properly positioned drains with minimal discharge. On March 5, CT of the neck and thorax revealed large amounts of aeroliquid collections in the anterior upper and lower mediastinum and in the left thorax. In the afternoon, incision was made in general anesthesia under the xyphoid process which was resected; the anterior lower mediastinum was bluntly prepared with fingers, joining with the fingers from the upper mediastinum throughout the retrosternal space. The aeroliquid collections were removed, the mediastinum was abundantly rinsed, then two retrosternal drains were placed and pulled out at the jugulum and under the xyphoid process. At the same time, the previous drain was removed from the left thorax and a new one was inserted. On the next day, control CT showed no signs of aeroliquid collections in the mediastinum, with only a minimal effusion in the left and right bases. Multiple control US studies of the chest were performed and pus samples were obtained for bacteriological analysis with antibiotic therapy correction. During the next two days, the patient was afebrile, eupneic, of good general condition and normal laboratory findings, and was therefore transferred to the ward on March 10. Prior to leaving ICU, the right thorax was redrained, with evacuation of some 300 mL of turbid brownish effusion. The effusion findings repeatedly showed MRSA and appropriate therapy was prescribed. Three days later, the drains were out of function and lung x-ray showed normal finding, so the drains were removed, with regular dressing of the neck and thorax wounds. All wound healed on second intention with regular dressing, however, leaving a major defect on the skin of the neck on the left. Therefore, plastic surgery of the left supraclavicular region was performed in general anesthesia on April 26, with a rotational pectoral muscle flap from the right side, as the left one was damaged during the second operation (Professor Bumber). The patient stayed for three days at ICU, and then was transferred to the ward, with regular dressing exchange, RBC and electrolyte correction; the wound healed on second intention. Control examination by the ENT specialist was normal and the patient was discharged from the hospital for home care.

The patient stayed at the Department for 83 days, of these 28 days at ICU. Drainage and redrainage of the right and left thorax were performed on seven occasions over 46 days. The patient presented for regular control visits at our outpatient clinic for the next six months, then once a year for two years. All findings including lung x-ray, thorax CT, laboratory tests and local findings were within the normal limits, with a minimal cosmetic defect, and with normal private and occupational quality of life.

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Sažetak

DESCENDENTNI NEKROTIZIRAJUĆI MEDIJASTINITIS

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Descendentni nekrotizirajući medijastinitis je ozbiljna gnojna infekcija medijastinuma koja najčešće nastaje spuštanjem infekta iz područja usne šupljine ili vrata. Smrtnost je i dalje vrlo visoka (preko 40%) usprkos današnjim mogućnostima liječenja konzervativnim ili kirurškim putem. Bolest se može pojaviti kod svih dobnih skupina, kako kod muškaraca tako i kod žena. U liječenju bolesti najvažnije je rano postavljanje dijagnoze kako bi se odmah započela intenzivna antibiotska terapija, a u slučaju spuštanja gnojnog procesa u prsni koš kirurška intervencija. Prikazuje se bolesnik s descendentnim nekrotizirajućim medijastinitisom koji je u početku liječen antibioticima, a zbog propagacije bolesti i kirurškim zahvatom. Tijekom kirurškog zahvata razvila se za život opasna komplikacija, erozija lijevostranog venskog spoja.

Ključne riječi: *Medijastinitis – etiologija; Medijastinitis – dijagnostika; Medijastinitis – terapija; Medijastinitis – kirurgija; Medijastinitis – komplikacije; Prikaz slučaja*