International Surgery Journal
Hazem Z et al. Int Surg J. 2020 Nov;7(11):3647-3650
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20204665

Original Research Article

Hyperbaric oxygen therapy as an adjunctive treatment for descending necrotizing mediastinitis: about 6 cases

Zribi Hazem[1], Ammar Abderrahmen[1], Abdelkbir Amina[1]*, Ben Ayed Ahmed[1], Touil Ameny[2], Marghli Adel[1]

[1]Department of Thoracic and Cardiovascular Surgery, Abderrahmen Mami hospital Ariana, Tunisia
[2]Department of Pneumology IBN, Abderrahmen Mami hospital Ariana, Tunisia

Received: 27 June 2020
Revised: 30 August 2020
Accepted: 02 September 2020

***Correspondence:**
Dr. Abdelkbir Amina,
E-mail: aminaabdelkbir@gmail.com

ABSTRACT

Background: The objective study was to evaluate the use and the effectiveness of hyperbaric oxygen therapy as an adjuvant therapy in 6 cases of descending necrotizing mediastinitis.
Methods: This is a retrospective descriptive study, performed between 2010 and 2019. Hyperbaric oxygen therapy was indicated in difficult clinical management cases despite surgery and antibiotic therapy.
Results: Six patients had oxygen therapy sessions in addition to antibiotic treatment and surgery. There was marked clinical and radiological improvement in 5 cases. Only one patient died in a septic shock.
Conclusions: Hyperbaric oxygen therapy, as adjuvant therapy to surgery and antibiotic treatment, can increase survival and provide good clinical results.

Keywords: Hyperbaric oxygen, Antibiotic therapy, Necrotizing mediastinitis

INTRODUCTION

Descending necrotizing mediastinitis (DNM) is a polymicrobial disease due to the extension of an oropharyngeal or cervical infection toward the mediastinum.

The lack of an anatomic barrier between the cervical region and the mediastinum on one hand and the virulence of the germs responsible for this disease on the other hand explain the speed of extension of the infection and the seriousness of this disease. Thereby, despite the achieved progress in the management of the DNM, the postoperative death rate goes up to 20% these last years.[1]

Despite the early systemic administration of a broad-spectrum antibiotic therapy and the surgical drainage of any pus collection, the DNM is always life-threatening.[2,3]

The hyperbaric oxygen (HBO), would be very useful in the management of the DNM by the control of the anaerobic infection. Therefore, when combined to the usual treatment, it would improve survival in the patients with this serious disease.

METHODS

In this observation study, we retrospectively reviewed the medical records of 6 patients operated for a DNM in our thoracic and cardiovascular surgery department in Ariana between 2010 and 2019. These patients received multiple hyperbaric oxygen therapy sessions in addition to an antibiotic therapy and a surgical treatment. All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

RESULTS

In this study the 6 patients were 4 men and 2 women. The mean age of our patients was 31 years. Two of these patients had a diabetes under treatment. One female patient was followed up for a multinodular goiter. The use of non-steroid anti-inflammatory drugs was noted in two patients. The diagnosis was established after an emergency cervico-thoracic scan. The intervention consists of a debridement and a drainage of abscessed cervical, mediastinal and pleural collections through a Kocher cervicectomy, combined with a lateral thoracotomy in two patients.

Table 1 sums up the characteristics of patients in this study and the different surgical acts.

Post-operatively, all the patients received initially an empiric therapy with antibiotics, which was adjusted later on according to the isolated germs from preoperative sample.

The HBO was initiated on average on the sixth postoperative day. The mean number of sessions made was 10. Not noticed any side effect for the HBO.

The evolution of the disease was marked by a good clinical, biological and radiological progression in 5 patients after handling the postoperative complications. However, one patient was deceased due to a septic shock antibiotic and catecholamines.

Table 2 highlights the complications and the postoperative therapy in patients of this study.

Table 1: Characteristics of patients in this study and the different surgical acts.

Patient	Age (years)	Sex	Antecedents	Infectious origin	Scan aspects	Delay before surgery (days)	Surgical approach	Surgical act
1	49	Female	Diabetes	Dental abscess	Expanding latero-cervical lesion on the right side toward the mediastinum	4	Cervicotomy	Debridement, cervical and mediastinal drainage
2	5	Male	None	Sore throat	Densification of the anterior mediastinal fat, presence of air bubbles and encysted bilateral pleurisy	6	Cervicotomy and lateral thoracotomy	Debridement, cervical, mediastinal and pleural drainage
3	38	Male	None	Dental abscess	Retro and parapharyngeal collections, middle and anterior mediastinal collections	4	Cervicotomy	Debridement, cervical and mediastinal drainage
4	45	Female	Goitre multi-nodulaire	Cervical abscess	Expanding right submandibular collection toward the neck and anterior mediastinum	8	Cervicotomy	Debridement and surgical scrub
5	41	Male	Diabetes and NSAID intake	Sore throat	Right cervical collection, anterior mediastinal collection and encysted pleural collection	9	Cervicotomy and lateral thoracotomy	Debridement and breaking down the cervical and pleural purulent pockets
6	12	Male	None	Parotiditis	Left head and neck cellulitis and anterior mediastinal collection	5	Cervicotomy	Debridement and breaking down the purulent pockets

Table 2: Complications and postoperative therapy in patients of this study.

Patient	Post opérative complications	Length of intubation (Days)	Initial hemodynamic instability (before the 5th postoperative day)	Onset of HBO after the surgical act (days)	No. of sessions	Postop stay length (Days)	Early death
1	Pneumonia and ARDS	6	Yes	7	10	26	No
2	Severe sepsis and central venous catheter infection	9	No	5	13	60	No
3	A Kp urinary tract infection	8	Yes	6	13	28	No
4	Pneumonia	12	Yes	6	11	36	No
5	Septic shock	7	Yes	4	4	7	Yes
6	No complicatons	3	No	2	9	22	No

ARDS: acute respiratory distress syndrome; Kp: *Klebsiella pneumoniae*.

DISCUSSION

The death rate related to DNM remains as high as 25% despite the broad-spectrum antibiotic therapy and the aggressive surgical drainage.[2]

These infections tend to quickly spread inside a region as vital as the mediastinum, they are usually associated with life threatening septicemia. However, efficient drainage is too often delayed due to difficult early diagnosis.[3]

These infections are polymicrobial, which makes it so difficult to handle by only using antibiotic therapy.

The HBO debuted in 30's and consist of administration of fraction of inspired oxygen equal to 100% in an environmental pressure superior to atmosphere pressure on sea level using specific chambers increasing level of oxygen in arterial blood up to 20 times.

The HBO provides beneficial biochemical and cellular effects for the DNM. Among these effects we find the reverse of the tissue hypoxia, the increase of the phagocytic capability against certain bacteria, which grants for the leukocytes the ability to kill both aerobic and anaerobic microorganisms.[4]

The anaerobic bacteria are as well extremely sensitive to the direct effects of the high-pressure oxygen.[5]

These effects are crucial to angiogenesis and recovery of tissues, and therefore the improvement of the microvascular irrigation.[6]

The results in the published series are contradictory due to the lack of a standardized protocol and the heterogeneity of patients included in these studies. In a retrospective study about 49 patients diagnosed with mediastinitis, a death rate of 15,4% was noted in patients who received an HBO which was considerably lower than in patients who didn't receive HBO (>40%).[7,8]

Some recently published case reports noted good therapeutic results when the HBO is combined to antibiotic therapy and surgical acts for the DNM.[9]

However, the HBO is not complications free. May note in some cases barotraumas including pneumothorax and oxygen toxicity.[6]

In present study, the use of HBO was late, on the 5th day of the therapy on overage, due to the postoperative hemodynamic or respiratory instability. Furthermore, the dispersion of the centers equipped with HBO in the country doesn't allow to include this therapy for all the patients in need for it. This may explain the reason why this therapy is only reported in few series or cases similar to this study.

Limitations

This descriptive and retrospective study was carried out at a single center without a control group; therefore, it has limitations related to its methodology. We shall bear in mind that our study consists of a small number of patients. Cases buildup from other studies and prospective analyses are needed to draw up the management of DNM.

CONCLUSION

The DNM is a short-term life-threatening serious infection. The surgical therapy and an early adapted antibiotic therapy remain the key elements of initial management of the DNM. The addition of the HBO provides beneficial effects over bacterial growth which can improve the survival of patients.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Wheatley MJ, Stirling MC, Kirsh MM, Gago O, Orringer MB. Descending necrotizing mediastinitis: Transcervical drainage is not enough. Ann Thorac Surg. 1990;49(5):780-4.
2. Amor BM, Dakhlaoui J, Souissi H, Balma A, Labbène I, Ferjani M. Hyperbaric oxygen therapy as an adjunctive treatment for acute mediastinitis due to oesophageal perforation: a case report. Ann Fr Anesth Reanim. 2007;26(10):862-4.
3. Said S, Cooper CJ, Teleb M, Hernandez GT. Descending Necrotizing Mediastinitis of Odontogenic Origin in a Young Male Patient: Case Report and Discussion. Am J Med Case Rep. 2014;2(2):44-7.
4. Mader JT, Brown GL, Guckian JC, Wells CH, Reinarz JA. A mechanism for the amelioration by hyperbaric oxygen of experimental staphylococcal osteomyelitis in rabbits. J Infect Dis. 1980;142(6):915-22.
5. McCord JM, Keele BB, Fridovich I. An enzyme-based theory of obligate anaerobiosis: the physiological function of superoxide dismutase. Proc Natl Acad Sci USA. 1971;68(5):1024-7.
6. Hang LW, Lien TC, Wang LS, Wang JH. Hyperbaric oxygen as an adjunctive treatment for descending necrotizing mediastinitis: A case report. Chin Med J Taipei. 1997;60(1):52-6.
7. Barthelemy A. Médiastinites. In: Wattel F, Mathieu D, editors. Traité de médecine hyperbare. Paris: Ellipses. 2002;303-8.
8. Estrera AS, Landay MJ, Grisham JM, Sinn DP, Platt MR. Descending necrotizing mediastinitis. Surg Gynecol Obstet. 1983;157(6):545-52.
9. Kamiyoshihara M, Hamada Y, Ishikawa S, Iizuka T, Nakano M, Morishita Y. Hyperbaric oxygen as an adjunctive treatment for descending necrotizing mediastinitis: report of a case. Kyobu Geka. 2000;53(8):715-7.

Cite this article as: Hazem Z, Abderrahmen A, Amina A, Ahmed BA, Ameny T, Adel M. Hyperbaric oxygen therapy as an adjunctive treatment for descending necrotizing mediastinitis: about 6 cases. Int Surg J 2020;7:3647-50.