

# Surgical Treatment of Tuberculous Cold Abscess of the Chest Wall

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The incidence of tuberculosis (Tbc) infection is high in some parts of the world and tuberculous cold abscess of the chest wall (CACW) often fails to respond to medical treatment. Medical records of 178 patients who underwent surgical treatment of chest wall abscesses from July 1970 to Sept. 2000 were reviewed and 89 patients who were pathologically confirmed as Tbc cold abscess cases were included in this study. Their ages ranged from 9 to 71 years (mean 33.3 years) and the male to female ratio was 1.2:1 (49 male, 40 female). The symptoms were palpable chest wall mass, pain and pus discharge, and three patients had multiple lesions. Twenty-five patients (28%) underwent excision of chest wall abscesses and 64 patients (72%) underwent chest wall and rib resection. Tbc medication was given preoperatively in 39 patients for an average of 6.3 months and all patients were given Tbc medication postoperatively for an average of 12 months. Postoperative complications were bleeding, pus discharge, empyema, pleural effusion, wound dehiscence, subcutaneous emphysema and activation of pulmonary Tbc. The disease recurred in 7 patients (7.8%) and these 7 patients all underwent a second operation. We recommend preoperative Tbc medication and complete resection of chest wall abscesses including any suspicious ribs. Postoperative Tbc medication for a minimum of 12 months is essential to decrease the risk of a relapse.

**Key Words:** Tuberculosis, cold abscess, chest wall, anti-tuberculosis medication, chest wall resection

## INTRODUCTION

Chronic infections of the thoracic cage may originate from pyogenic organisms, blood born infections or infections invading the area by direct extension from an adjacent focus. Many cases are tuberculous in origin as the incidence of tuberculosis has not decreased in some parts of the world, and also due to the fact that more than half of the world's tuberculosis-infected persons reside in Asia.<sup>1</sup> Most patients are affected by pulmonary or pleural tuberculosis and skeletal localizations are rarely encountered, accounting for one to five percent of all tuberculous infections.<sup>2-4</sup> Most skeletal localizations occur in vertebrae, hip, and knees and the incidence of rib involvement is reported to be from zero to three percent.<sup>3-5</sup>

Tuberculous (Tbc) cold abscess of the chest wall (CACW) often fails to respond to medical treatment and clinical presentation may resemble pyogenic abscess or chest wall tumors. We reviewed 89 patients who underwent surgical resection of CACW caused by *Mycobacterium tuberculosis* and analyzed the indications and methods of surgery, results, perioperative complications and postoperative treatment.

## MATERIALS AND METHODS

In the Department of Thoracic and Cardiovascular Surgery, Yonsei University, Seoul, Korea, we retrospectively reviewed records of 178 patients who underwent surgical treatment of chest wall abscess from July 1970 to Sept. 2000. Eighty-nine patients were pathologically confirmed as

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tuberculous CACW either by preoperative fine needle aspiration biopsy or by postoperative specimens showing giant cells and caseous necrosis or tubercle bacilli. Patients with pulmonary tuberculosis, tuberculous pleural effusion, and tuberculous empyema were excluded from this study.

## RESULTS

Among these 89 patients, there were 49 males and 40 females (ratio of 1.2:1), with ages ranging from 9 years to 71 years (mean, 33.3 years old). Past records revealed a history of pulmonary tuberculosis in 56 patients (62.9%). Common symptoms were palpable chest wall mass in 62 patients (69.6%), chest pain in 48 patients (53.9%) and pus discharge from the lesion in 8 patients (8.9%) (Table 1). Eighty-six patients (96.6%) had cold abscesses as a solitary lesion in the chest wall in the form of pustules or mass-like indurations. Three patients (3.4%), who were immunocompetent, had abscesses in multiple locations (Table 2).

Tbc medication was given preoperatively in 39 patients (43.8%) for an average of 6.3 months (range, 1-36 months) and in all patients postoperatively for an average of 12 months (range, 4-33 months). Twenty-five patients (28.1%) underwent excision and drainage of chest wall abscesses and 64 patients (71.9%) had resection of the involved ribs (1 rib-45 cases, 2 ribs-17 cases, 3 ribs-2 cases)

**Table 1.** Preoperative Symptoms

Symptoms	Number (%)
Palpable mass	62 (69.6)
Chest pain	48 (53.9)
Pus discharge	8 (8.9)
Profuse sputum	2 (2.2)

**Table 2.** The Locations Involved in Patients with Multiple Abscess

Patient	Involved
23 year female	Chest wall, sternum, neck
30 year female	Chest wall, mediastinum, submandibular, axilla, spleen, liver
23 year female	Chest wall, paravertebral, neck

with chest wall abscesses. In addition to rib resection, one patient had resection of part of the clavicle and the sternum, and 5 patients had lung resection at the time of operation (3 wedge resections, 1 segmentectomy, 1 lobectomy) (Table 3).

Postoperative complications were as follows: 4 cases of wound infection, 2 cases each of empyema thoracis and activation of pulmonary Tbc, and one case each of bleeding, pleural effusion, wound dehiscence, atelectasis, and subcutaneous seroma. There was no difference in the complication rate between the 39 patients given preoperative Tbc medication and the 50 patients not given Tbc medication (Table 4). In the 25 patients who only underwent excision of abscesses, 4 complications (16%) occurred compared to 9 complications (14%) in the 64 patients who underwent rib resection.

The disease recurred in 7 patients (7.8%) in the postoperative period between 4 months and 12 years, and all of these underwent a second operation (Table 5). Four patients, who had abscess excision during the first operation, experienced a recurrence of the disease at the same site, at 5, 17, 27, and 48 months respectively into the postoperative period, and all underwent rib resection in addition to chest wall abscess (excision?). Three patients who underwent rib resection during the first operation needed a second operation due to cold abscess formation on the contralateral side and in the axilla. One patient had cold abscess formation at the same site 12 years after the first operation and underwent further resection of the rib. This patient needed a third operation 24 months later for abscess excision at the same location. Another patient who had rib resection 48 months after abscess excision underwent a third operation 5 months later due

**Table 3.** Type of Operation

Name of operation	Number (%)
AE	25 (28.1)
AE + RR	57 (64.1)
AE + RR + clavicle, sternum resection	1 (1.1)
AE + RR + lung resection	5 (5.6)
AE + RR + myoplasty	1 (1.1)

AE, abscess excision; RR, rib resection.

**Table 4.** Comparison of Complications Depending on Preoperative Tbc Medication

Tbc medication	Operation	No. (%)	Complications
Medication	AE	11 (12.4)	empyema 1 bleeding 1 wound infection 1
	RR	28 (31.5)	wound infection 2 empyema 1 Tbc activation 2
No medication	AE	14 (15.7)	wound infection 1
	RR	36 (40.4)	pleural effusion 1 wound dehiscence 1 atelectasis 1 seroma 1

AE, abscess excision; RR, rib resection.

**Table 5.** Type of Operation in Patients Who Underwent Re-operation

1 <sup>st</sup> Operation	Interval	2 <sup>nd</sup> Operation
AE	5 months	RR
AE	17 months	RR
AE	48 months	RR*
AE + LR	27 months	RR
RR, right	11 months	RR, left
RR, left	4 months	AE, axilla
RR	12 years	RR*

AE, abscess excision; RR, rib resection; LR, lung resection.

Interval: interval between first and second operation.

\*Underwent third operation after interval of 5 and 24 months.

to abscess formation at the previously operated site.

## DISCUSSION

Primary tuberculosis of the chest wall is rare and its clinical feature may resemble pyogenic abscess or tumor and distinguishing between them can be difficult. Tuberculous cold abscesses of the chest wall are not frequently encountered and reportedly represent less than 10% of all skeletal tuberculosis cases.<sup>3,4,6,7</sup> The presentation of cold abscesses is a progressively enlarging mass with or without destruction of the underlying bone or cartilage, and the consistency of the mass may be soft or firm.

There are three mechanisms in the pathogenesis

of rib tuberculosis; direct extension from pleural or pulmonary parenchymal disease,<sup>8</sup> hematogenous dissemination of a dormant tuberculous focus,<sup>9</sup> or direct extension from lymphadenitis of the chest wall.<sup>10</sup> Kaufmann has shown in his surgical specimens, the relationship between cold abscesses and the caseous lymph nodes of the chest wall such as the internal mammary, intercostal, and paravertebral nodes.<sup>10</sup> Because a normal chest x-ray does not exclude the possibility of current or previous episodes of tuberculous infection,<sup>11</sup> the etiology of tuberculous cold abscess such as its direct spread from the pulmonary foci or from lymphatic spread cannot be distinguished. Reduced cellular immunity, locally or systemically, due to underlying medical conditions, may be a factor in the development of cold abscess.<sup>12</sup>

The diagnosis of rib tuberculosis with CACW is difficult and its treatment still remains controversial as it is often diagnosed postoperatively. It is difficult to distinguish subcutaneous tuberculous abscess from chest wall tumor,<sup>12</sup> and a needle aspiration biopsy seems to be the procedure of choice in detecting acid-fast bacilli in direct smear<sup>8,13,14</sup> or culture<sup>8,12,13</sup> although Faure et al.<sup>15</sup> reported only a 36.3% (4/11) success rate of diagnosis by needle aspiration. The possibility of cold abscess caused by mycobacteria other than tuberculosis is possible. However, in this review, all cases with evidence of caseous necrosis, giant cells, and presence of AFB were diagnosed as cold abscess.

A chest CT scan should be done in every patient in order to exclude the possibility of a chest wall tumor being present, although it is difficult to differentiate between them. Chest CT scan findings of CWCA are variable in that some reported it as a low attenuated central area without rim enhancement<sup>12</sup> (Fig. 1), in contrast to bone and costal cartilage destruction, (while others reported it as?) soft tissue mass with calcification or rim enhancement with or without evidence of underlying lung or pleural disease (Fig. 2).<sup>16</sup> Ultrasonography of the chest wall is advantageous in that it can be performed at the



Fig. 1. Chest CT findings showing chest wall abscess in lower thoracic cage with involvement of pleura.



Fig. 2. Chest CT findings showing anterior chest wall abscess with minimal bone destruction and rim enhancement without evidence of underlying lung or pleural disease.

bedside with specimens obtained from multiple sites under ultrasonic guidance when the size of the abscess is large and while avoiding the use of radiation.<sup>12</sup>

CACW usually occurs as a solitary lesion<sup>15,17</sup> and occurs more frequently at the margins of the sternum and in the shafts of the ribs.<sup>15,17-20</sup> It has been reported to occur more frequently in males<sup>8,15,18,19</sup> although our data showed only a 1.2:1 ratio favoring males. There are different opinions regarding the age at which the disease is encountered. Some reports gave the peak incidence in ages between 15 and 35 years,<sup>18-20</sup> whereas other reports gave older age ranges.<sup>8,12,15</sup> Our cases had a mean age of 33.3 years. The youngest patient in this study was a 9 years old male who complained of palpable chest wall mass and chest pain, and underwent excision of abscesses with resection of 7<sup>th</sup> and 8<sup>th</sup> ribs. His postoperative course was uneventful and he has had 12 months of anti-tuberculosis medication with no evidence of recurrence during 126 months follow-up.

Past incidence of pulmonary tuberculosis was noted to be as high as 83%<sup>15</sup> and the incidence of active pulmonary tuberculosis ranged from 17.4% to as high as 62.5%.<sup>17-19</sup> Our data shows 56 patients (63%) revealing past history of pulmonary tuberculosis and 39 patients (43.8%) who were given anti-Tbc medication prior to surgery due to clinical impression of active pulmonary tuberculosis. Preventive therapy of tuberculosis was undertaken by various authors<sup>21-26</sup> and most of the reports recommend 6 to 12 months of therapy, with higher relapse rates occurring with less than 6 months of therapy, and no supplementary benefit with longer than 12 months of medication.<sup>21,22,25</sup> These reports recommended that preventive therapy target persons most likely to develop tuberculosis.<sup>26</sup> The negative side of preventive therapy, without definite medical or surgical diagnosis, is that it can delay true diagnosis while the patient is on anti-tuberculosis therapy.

Proper method of treatment in CACW is controversial. The definition of a successful treatment of Tbc is one having a relapse rate of less than 5%, 2 years after completion of therapy.<sup>27</sup> Good results has been achieved by using current anti-Tbc drugs

for 6 to 12 months,<sup>8,12,14</sup> although many reported the development of cold abscesses when the medical treatment was the only treatment given.<sup>8,28</sup> Combination therapy should be used in order to increase efficacy and to reduce the risk of developing resistance, since multi-drug resistance (MDR-Tbc) is the most critical event which can arise during medical treatment. The most common cause of developing multi-drug resistance is the failure by the patient to follow the assigned course of treatment regularly.<sup>29</sup> Tuberculous cold abscesses can develop while the patient is being treated for pulmonary tuberculosis, although they may disappear after continuous treatment with the same regimen, usually one including the use of isoniazid, ethambutol, rifampin and pyrazinamide. Therefore, the development of Tbc cold abscesses does not necessarily indicate treatment failure.<sup>30</sup>

The (available/current?) methods of surgical treatment are also controversial and vary from repeated aspiration, excision of the abscess with primary closure,<sup>15</sup> to resection of the ribs even if they are macroscopically normal. In some patients, the origin of the abscess may lie in a deeper layer, and Brown and Trenton perform extensive debridement of the tissue surrounding the abscess cavity<sup>20</sup> while Weissberg suggests treatment by giving antimicrobials and drainage of abscesses, reserving debridement and excision only for extensive diseases. 15 Our data shows that 4 patients (16%) who had excision of abscesses relapsed. Three patients who had rib resection underwent a second operation, but only one patient (1.6%) experienced a recurrence at the same site, thus showing a lower incidence of recurrence in patients undergoing rib resection at the time of the first operation. However, since this is a retrospective study, some of the patients with recurrence might not have visited the same hospital, thus incorrectly causing lower levels of recurrence to be observed.

We recommend postoperative medical treatment using isoniazid (H), ethambutol (E), rifampin (R), and pyrazinamide (Z) for 2 months followed by 10 months of HER, in which case the majority of patients were cured without further medical treatment. However, disease recurred in 7 patients (7.8%) and they all underwent a second operation.

Recurrence of the disease does not necessarily mean treatment failure, since the disease may recur or a new lesion may develop even with the proper medical treatment, although non-adherence to the treatment by the patient is a likely cause of recurrence. According to Faure et al.,<sup>15</sup> the only patient who relapsed after resection in 17 patients was one who refused medical treatment.

In conclusion, we recommend preoperative Tbc medication and complete resection of chest wall abscesses, including any suspicious ribs. Postoperative Tbc medication for a minimum of 12 months is essential to decrease the chances of a recurrence of the disease, and maintaining a high degree of suspicion of cold abscesses is mandatory, especially in endemic areas.

## REFERENCES

1. Grosset JH, O'Brien RJ. Advances in Tuberculosis Preventive Therapy. *Semin Respir Crit Care Med* 1997; 18:449-57.
2. Enarson DA, Ashley MJ, Grzybowski S, Ostapkowicz E, Dorken E. Non-respiratory tuberculosis in Canada: epidemiologic and bacteriologic features. *Am J Epidemiol* 1980;112:341-51.
3. Newton P, Sharp J, Barnes L. Bone and joint tuberculosis in greater Manchester 1969-1979. *Ann Rheum Dis* 1982;41:1-6.
4. Davies PDO, Humphries MJ, Byfield SP, Nunn AJ, Darbyshire JH, Citron KM, et al. Bone and joint tuberculosis: a survey of notifications in England and Wales. *J Bone Joint Surg* 1984;66B:326-30.
5. Enarson DA, Fujii M, Nakielna EM, Grzybowski S. Bone and joint tuberculosis: a continuing problem. *Can Med Assoc J* 1979;120:139-45.
6. Rathakrishnan V, Mohd TH. Osteo-articular tuberculosis. *Skeletal Radiol* 1989;18:267-72.
7. Goldblatt M, Cremin BJ. Osteo-articular tuberculosis: its presentation in coloured races. *Radiology* 1978;29: 669-77.
8. Hsu HS, Wang LS, Wu YC, Fahn HJ, Huang MH. Management of primary chest wall tuberculosis. *Scand J Thorac Cardiovasc Surg* 1995;29:119-23.
9. Wiebe ER, Elwood RK. Tuberculosis of the ribs: a report of three cases. *Respir Med* 1991;85:251-3.
10. Kaufmann R. Quelques considérations sur l'abcès froid thoracique. *J Chir* 1931;37:829-41.
11. American Thoracic Society. Diagnostic standards and classification of tuberculosis and other mycobacterial diseases. *Am Rev Respir Dis* 1981;123:343-55.
12. Chen CH, Shih JF, Wang LS, Perng RP. Tuberculous subcutaneous abscess: an analysis of seven cases. *Tuber*

- Lung Dis 1996;77:184-7.
13. Ward AS. Superficial abscess formation: an usual presenting feature of tuberculosis. *Br J Surg* 1971;58: 540-3.
  14. Blunt SB, Harries MG. Discrete pleural masses without effusion in a young man: an unusual presentation of tuberculosis. *Thorax* 1989;44:436-7.
  15. Faure E, Souilamas R, Riquet M, Chehab A, Le Pimpec-Barthes F, Manac'h D, et al. Cold Abscess of the Chest Wall: A Surgical Entity? *Ann Thorac Surg* 1998; 66:1174-8.
  16. Adler BD, Padley SPG, Muller NL. Tuberculosis of the chest wall: CT findings. *J Comput Assist Tomogr* 1993; 17:271-3.
  17. Burke HE. The pathogenesis of certain forms of extra-pulmonary tuberculosis: spontaneous cold abscesses of the chest wall and Pott's disease. *Am Rev Tuberc* 1950; 62:48-67.
  18. Tatelman M, Drouillard EJP. Tuberculosis of the ribs. *Am J Roentgenol* 1953;70:923-35.
  19. Lee G, Im JG, Kim JS, Kang HS, Han MC. Tuberculosis of the ribs: CT appearance. *J Comput Assist Tomogr* 1993;17:363-6.
  20. Brown RB, Trenton J. Chronic abscesses and sinuses of the chest wall: the treatment of costal chondritis and sternal osteomyelitis. *Ann Surg* 1952;135:44-51.
  21. Plamer CE, Ferebee SH, Hopwood L. Studies on prevention of experimental tuberculosis with isoniazid. II. Effects of different dosage regimens. *Am Rev Tuberc* 1956;74:917-39.
  22. Comstock GW, Woolpert SF. Preventive therapy. In: Kubica GP, Wayne LG, editors. *The mycobacteria. A sourcebook*. New York: Marcel Dekker, Inc.; 1994. p.1071-82.
  23. Ferebee SH. Controlled chemoprophylaxis trials in tuberculosis. A general review. *Adv Tuberc Res* 1970; 17:29-106.
  24. Groth-Peterson E, Gad U, Ostergaard F. Mass chemoprophylaxis of tuberculosis. *Am Rev Respir Dis* 1960; 83:643-52.
  25. Comstock GW, Ferebee SH. How much isoniazid is needed for prophylaxis? *Am Rev Respir Dis* 1970;101: 780-2.
  26. American Thoracic Society and Centers for Disease Control and Prevention. Treatment of tuberculosis and tuberculosis infection in adults and children. *Am J Respir Crit Care Med* 1994;149:1359-74.
  27. Hopewell P, Cynamon M, Starke J, Iseman M, O'Brien R. Evaluation of new anti-infective drugs for the treatment and prevention of tuberculosis. *Clin Infect Dis* 1992;15:S282-S295.
  28. Chang JH, Kim SK, Kim SK, Chung KY, Shin DH, Joo SH, et al. Tuberculosis of the ribs: a recurrent attack of caries. *Yonsei Med J* 1992;33:374-8.
  29. Fox W. The modern management and therapy of pulmonary tuberculosis. *Proc R Soc Med* 1977;70:4-15.
  30. Chen CH, Tsai JJ, Shih JF, Perng RP. Tuberculous subcutaneous abscesses developing during chemotherapy for pulmonary tuberculosis. *Scand J Infect Dis* 1993;25:149-52.