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Parenchyma-preserving and minimally invasive thoracotomy technique in giant pulmonary hydatid cysts

Dev pulmoner kist hidatiklerde parankim koruyucu ve minimal invaziv torakotomi tekniği

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ABSTRACT

Background: This retrospective study aims to present our parenchyma-preserving and minimally invasive operation experiences on giant pulmonary hydatid cysts.

Methods: Nineteen patients (13 males, 6 females; mean age 22 years) with giant hydatid cysts were operated. The outermost layer of the giant cyst, the adventitia, was excised up to the normal parenchyma, and the previously detected bronchial leaks were closed. The released adventitia were reciprocally sutured into the parenchyma.

Results: Hydatid cysts were in the right hemithorax in 13 patients, in the left hemithorax in five patients, and bilateral in one patient. The safe bronchial closure prevented pulmonary volume loss without stretching the parenchyma. Operative complications were pleural effusion in one patient, atelectasis in two patients, wound infection in one patient, and pneumonia in three patients. The diameter of cysts, measured by computed tomography, was approximately 10 cm. The mean duration of hospitalization was 7.5 days.

Conclusion: Current treatment of hydatid cysts should allow pulmonary expansion after complete surgical removal of the cyst. Thanks to parenchyma-preserving and minimally invasive thoracotomy technique, none of the operated patients required resection. Advantages of our technique include low rate of complications, and removal of the cyst using a single thoracic drain with minimally invasive thoracotomy without requiring capitonnage.

Keywords: A new technique; giant hydatid cysts; minimally invasive thoracotomy.

ÖZ

Amaç: Bu retrospektif çalışmada dev pulmoner kist hidatiklerde parankim koruyucu ve minimal invaziv ameliyat deneyimlerimiz sunuldu.

Çalışma planı: Dev kist hidatikli 19 hasta (13 erkek, 6 kadın; ort. yaş 22 yıl) ameliyat edildi. Dev kistin en dış katmanı olan adventisya normal parankime kadar eksize edildi ve önceden tespit edilen bronşiyal kaçaklar kapatıldı. Serbest hale gelen kistin adventisyası karşılıklı olarak parankim içerisine dikildi.

Bulgular: Kist hidatikler 13 hastada sağ hemitoraksta, beş hastada sol hemitoraksta ve bir hastada iki taraflı idi. Güvenli bronşiyal kapatma parankimi germeden pulmoner hacim kaybını engelledi. Ameliyata bağlı komplikasyonlar bir hastada plevral efüzyon, iki hastada atelektazi, bir hastada yara enfeksiyonu ve üç hastada pnömoni idi. Bilgisayarlı tomografi ile ölçülen kist çapları ortalama 10 cm idi. Hastanede ortalama kalış süresi 7.5 gün idi.

Sonuç: Güncel kist hidatik tedavisi kistin cerrahi ile tam olarak çıkarılmasını takiben pulmoner parankimin genişlemesine izin vermelidir. Parankim koruyucu ve minimal invaziv torakotomi tekniği ile ameliyat edilen hastaların hiçbirinde rezeksiyona gerek kalmadı. Tekniğimizin avantajları; düşük komplikasyon oranı ve kistin minimal invaziv torakotomi ile kapitonaj gerektirmeden tek bir drenle çıkılmasıdır.

Anahtar sözcükler: Yeni bir teknik; dev kist hidatikler; minimal invazif torakotomi.

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Hydatid cysts are parasitic infestations caused by Echinococcosis granulosus that are particularly endemic to rural areas and stock-raising regions of the Middle East, Central Asia, South America, Australia, New Zealand, and Turkey. Data from the Turkish Ministry of Health suggests that it occurs at an incidence rate of 12/100,000 is from Turkey.[1] The literature typically describes giant hydatid cysts as those with a diameter of over 10 cm, and only a few studies exist have focused on those of this size.[2] Even though pulmonary resection is an accepted technique for the surgical treatment of giant cysts, there is still controversy regarding this option. In this study, we aim to retrospectively present our newly gained knowledge related to our parenchyma-preserving, minimally invasive operative experiences for treating giant pulmonary hydatid cysts.

PATIENTS AND METHODS

In this study, we retrospectively reviewed the cases of 420 patients diagnosed with hydatid cysts who had undergone surgery between January 2004 June 2013 and found that 19 (13 males and 6 females; mean age 22 years; range 13 to 62 years) had undergone surgery for giant hydatid cysts. The diagnosis was made by anamnesis, chest radiography, and thoracic computed tomography (CT). In addition, abdominal ultrasonography (USG) was also performed on each patient. Hydatid cysts that involved more than 50% of a lobe were considered to be giant in nature.

A double-lumen tube was used during anesthesia to deflate the hemithorax where the thoracotomy was to be performed to prevent the existing cysts from rupturing and spreading into the other lung and the germinative membrane from passing from the wide bronchial mouth and creating complications. Anterior, posterior and lateral chest radiographs and thoracic CT (Figures 1 and 2) were used to precisely locate the cyst, and we obtained direct access from the top of the giant cysts via a mini-thoracotomy after pulmonary deflation of the particular lobe. After the cysts that extended to the thoracic wall were separated from the intercostal muscles in a controlled manner, the pressure of the cyst was lowered by supporting the perimeter of the cysts with polyvinylpyrrolidone sponges without fitting the thoracic retractor and by performing a puncture using a 10-gauge needle. The pulmonary tissue next to the cyst was then suspended by a clamp, and the pericystic layer was opened to gain access to the parasite membrane. Next, all fluid was drained using an aspirator after the cyst was opened, and the germinative membrane was removed. The resulting cavity was then cleaned with a sponge, and hypertonic saline was injected into the cyst and kept there for approximately 10 minutes. After that, the cavity, which had initially been prepared with pieces of the adventitia used to close the air leak was reopened and filled with physiological saline to reveal any further leak. The remaining parenchymal space was sutured to be obliterated (Figures 3a-c). This both ensured a safer closure of the leakage and prevented pulmonary volume loss without stretching the parenchyma. Finally, the remaining adventitial parenchyma was sutured over and over on itself with an absorbable suture. After this treatment, we searched for cysts in the other lobes as well, and the thorax was then closed routinely by inserting a tube. With this technique, none of the cases required resection, a localized minimal thoracotomy was performed, no capitonnage was done, and only a single thoracic drain was needed. As long as the patients had no contraindications, they were given albendazole 400 mg twice daily for a period of three weeks postoperatively. However, for patients under 60 kg, the dosage was calculated at 15 mg/kg/day, and divided into two doses of 7.5 mg/kg/day given twice daily. After

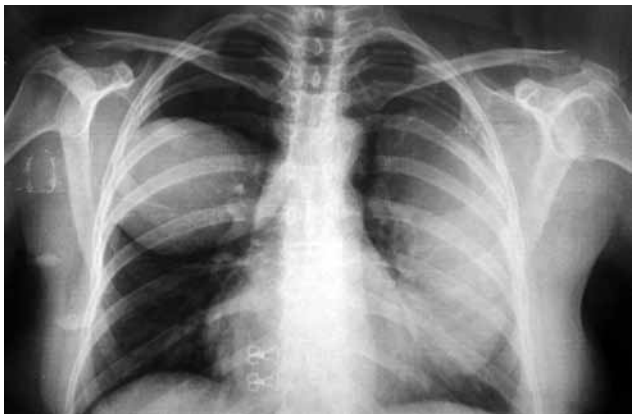

Figure 1. Posterior-anterior radiograph of the giant hydatid cyst.

Figure 2. Chest computed tomography showing the giant hydatid cyst.

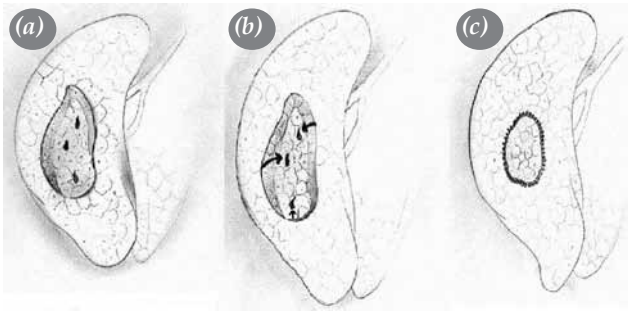

Figure 3. (a) The previously detected air leak was closed; **(b)** The freed and sufficiently released cystic adventitia were reciprocally sutured; **(c)** The remaining adventitial parenchyma was sutured over and over on itself with an absorbable suture.

administering the albendazole, the patients had a two-week break before this drug was administered again for a minimum of six months.

RESULTS

Hydatid cysts were found in the right hemithorax in 13 patients (68%), in the left hemithorax in five others (26%), and bilaterally in another (1%) (Table 1). Chest radiographs showed an air-fluid level in three patients, and round opacity with smooth margins was detected in 16 patients. During the operation, three of the giant hydatid cysts were found to be perforated, but the others were still intact. Furthermore, we did not intervene when hepatic cysts were detected in the same surgical session, and none of the cases had to be resected. Thirteen of the patients developed postoperative surgical complications, with prolonged air leak and atelectasis being seen most often (Table 2). The average hospitalization time was 7.5 days.

DISCUSSION

Lungs allow for cysts to grow because of their elasticity,[3] with the growth being more common among children.[4]

Table 1. Location of the hydatid cysts in the lungs

Pulmonary location	n	%
Right lung		
Superior lobe	5	26
Middle lobe	1	5
Lower lobe	1	5
Left lung		
Superior lobe	4	21
Inferior lobe	2	10.5
Total	13	100

In the study by Lamy et al.,[4] the cysts in three cases were over 6 cm in diameter, and these were identified as giant cysts, whereas Halezeroğlu et al.[5] considered giant cysts to be at least 10 cm in diameter. In our patients, we used the term "giant cysts" when more than 50% of the lobe was involved.

In adults, cysts can be identified by their early symptoms; therefore, they are less likely to be giant in size.[6] The symptoms and findings of giant hydatid cysts are no different than those observed with simple hydatid cysts and include coughing, dyspnea, fever, chest pain, hemoptysis, and desquamation. However, the most frequent symptom is the expectoration of the cyst liquid or membrane (hydatoptosis), which is associated with perforation. Coughing, chest pain, hemoptysis, hydatoptosis, and sputum were commonly observed in our cases,[7] with coughing being seen most often.

Hydatid cysts are generally localized in the right lower lobe, in 52-63% of all cases.[2-7] As previously mentioned, the cyst was detected in the right lung in 68% of the patients, in the left lung in 31%, and bilaterally in 1%. Since hydatid cysts can rupture in the bronchi or the pleural cavity and may cause significant complications because of the pressure being applied to vital organs, they should be treated as soon as they are diagnosed. Surgery is usually required for pulmonary hydatid cysts,[1-8] Cystotomy and capitonnage are the most widely done surgical procedures for the hydatid disease. However, in our cases, we chose to use the previously described procedure to prevent inoculation and anaphylaxis around the perimeter of the giant cyst. The surgical plan for giant hydatid cysts may differ from that used for simple cysts. Pulmonary resection is not recommended in hydatid cyst. However, with giant hydatid cysts, tissue preservation is not always possible 1. The primary purpose of surgery related to hydatid cyst diseases is the total excision of the disease, and a resection rate of between 6.6 and 13% for giant hydrated cysts has been reported.[9] Furthermore, Aletras and Symbas[2] recommended a lobectomy for cysts that occupy more than 50% of the

Table 2. Postoperative complications

	n	%
Prolonged air leak	4	30.7
Pleural effusion	1	7.6
Atelectasis	4	30.7
Wound infection	1	7.6
Pneumonia	3	23
Total	13	100

lobe. No resection was needed with our technique, and we believe that our method is more convenient than the lung-sparing surgery described by Dakak et al.[10,11]

In non-complicated smaller cysts, medical treatment is used for patients who cannot tolerate surgical operations or for those who reject surgical treatment.[12] Our postoperative complications included prolonged air leak in four patients (30%), pleural effusion in one patient (7.6%), atelectasis in four others (30.7%), wound infection in one (7.6%), and pneumonia in four others. (23%). Current treatment for hydatid cysts should allow for pulmonary expansion after the complete removal of the cyst. Therefore, the advantages of our technique are that none of our cases required resections, the rate of complication was low, a minimally invasive thoracotomy was performed, no capitonnage was needed, and a single thoracic drain was used. Although the basic treatment for pulmonary hydatid cysts is surgery, the purpose of the chemotherapy regimen that we performed was to reduce the risk of recurrence associated with hydatid cysts.[13-15]

Albendazole or mebendazole are common anthelmintics used in the medical treatment of hydatid cysts. Albendazole is normally the first choice of treatment since it has a high plasma level and is highly absorbed by the gastrointestinal system. It is usually administered at a dose of 400 mg twice a day for four weeks in two or three cycles with a 15-day break between the cycles to prevent the possibility of hepatic toxicity. Although the total treatment period usually ranges from 3-6 months, the drugs can be used for 6-12 months or even more depending on the condition of the cyst or cysts.[16]

While performing the thoracotomy, care should be taken when accessing the thorax because it is possible to enter the cystic area if caution is not used. However, performing minimally invasive thoracotomies for the giant cysts avoids this complication entirely.

In conclusion, to the best of our knowledge, there have been no reports in the literature describing the use of both a minimally invasive thoracotomy technique and parancyhma-preserving surgery. Although we have seen success with this combination at our facility, further studies are warranted to verify the validity of our findings.

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