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GÖĞÜS DUVARI TÜMÖRLERİ VE CERRAHİ YAKLAŞIMLAR

CHEST WALL TUMORS AND SURGICAL APPROACHES

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ÖZET

AMAÇ: Bu çalışmada, göğüs duvarı tümörleri nedeniyle cerrahi uygulanan hastaların klinik özellikleri, tümör tipleri, uygulanan cerrahi teknikler ve postoperatif sonuçlarının retrospektif olarak analiz edilmesi amaçlanmıştır.

GEREÇ VE YÖNTEM: 2000 ve 2023 yılları arasında tek merkezli çalışmada, çalışma kriterlerini karşılayan 154 olgu (92 erkek, 62 kadın; ortalama yaş: 42,39±19,44 yıl; dağılım, 1-84 yıl) retrospektif olarak incelendi. Cerrahi yöntemler "yumuşak doku eksizyonu (basit eksizyon, periost dahil eksizyon vb.), kaburga rezeksiyonu, kaburga+sternum rezeksiyonu" şeklinde detaylı olarak değerlendirildi. Rekonstrüksiyon gereksinimi olup olmadığı ve kullanılan materyal türleri kaydedildi.

BULGULAR: Olgularda en sık geliş şikâyeti şişlik (n=93, %60,3) ve ağrı (n=84, %54,5) idi. Göğüs duvarı tümörlerinin en sık yerleşim yeri sağ göğüs duvarı (n=72, %46,7) idi. Uygulanan cerrahi yaklaşımların %37,6'sı (n=58) yumuşak doku eksizyonu, %29,8'i (n=46) kaburga rezeksiyonu ve %16,8'i (n=26) kaburga+sternum rezeksiyonu şeklindeydi. Olguların büyük çoğunluğunda (n=134, %87) rekonstrüktif materyal kullanım gereksinimi görülmedi; rekonstrüksiyon materyali kullanımı ise en çok kaburga+sternum rezeksiyonu uygulanan olgularla ilişkiliydi (p<0,05). Tümörlerin %62,3'ünün (n=96) yumuşak doku kökenli ve %37,6'sının (n=58) kemik kıkırdak kökenli olduğu görüldü. Olguların %52'sinin benign ve %48'inin malign olduğu tespit edildi. Benign tümörler arasında en sık lipom (n=12, %8,5), kemik-kıkırdak kökenli olarak ise kondrom (n=9, %5,7) ve fibröz displazi (n=9, %5,7) gözlendi. Malign göğüs duvarı tümörleri içinde en sık mezenkimal tümör (n=6, %3,8) ve lenfoma (n=6, %3,8), kemik-kıkırdak kökenli olarak ise kondrosarkom (n=7, %4,5) tespit edildi. Çoğu olguda (%95,5) postoperatif komplikasyon görülmedi. Postoperatif tedavi, olguların %74,4'ünde (n=115) gerekli olmadı ve nüks %16,2 oranında (n=25) görüldü.

SONUÇ: Göğüs duvarı tümörlerinin tedavisi ve takibi, hem primer hem de metastatik lezyonlar açısından büyük önem taşımaktadır. Özellikle kaburga+sternum rezeksiyonu gibi geniş rezeksiyon gerektiren durumlarda rekonstrüksiyon yöntemleri ve materyal seçimi giderek önem kazanmaktadır.

ANAHTAR KELİMELER: Göğüs duvarı tümörü, Benign, Malign, Tedavi, Rrekonstrüksiyon.

ABSTRACT

OBJECTIVE: This study aimed to retrospectively analyze the clinical characteristics, tumor types, sugical techniques used,and postoperative outcomes of patients who underwent surgery for chest wall tumors.

MATERIAL AND METHODS: A total of 154 cases (92 males, 62 females; mean age: 42.39±19.44 years; range, 1-84 years) meeting the study criteria were retrospectively reviewed from a single-center study conducted between 2000 and 2023. The surgical methods were classified as "soft tissue excision (simple excision, including periosteal excision), rib resection, and combined rib+sternum resection". The need for and types of reconstructive materials were also recorded.

RESULTS: The most common presenting complaints were swelling (n=93, 60.3%) and pain (n=84, 54.5%). The most frequent tumor location was right chest wall (n=72, 46.7%). Among the surgical approaches, 37.6% (n=58) were soft tissue excisions, 29.8% (n=46) were rib resections, and 16.8% (n=26) were rib+sternum resections. The majority of cases (n=134, 87%) did not require reconstructive material, but the highest rate of reconstruction was associated with rib+sternum resection (p<0.05). Tumors were of soft tissue origin in 62.3% (n=96) and of bone-cartilage origin in 37.6% (n=58). Benign tumors accounted for 52%, while malignant tumors comprised 48%. The most common benign tumors were lipomas (8.5%), while the most frequent bone-cartilage benign tumors were chondromas (5.7%) and fibrous dysplasias (5.7%). Among malignant tumors, the most frequent soft tissue tumors were mesenchymal tumors (3.8%) and lymphomas (3.8%), while chondrosarcoma (4.5%) was the most common bone-cartilage tumor. No postoperative complications were observed in 95.5% of cases, no additional postoperative treatment was required in 74.4% of cases, and recurrence rate was 16.2%.

CONCLUSIONS: The treatment and follow-up of chest wall tumors are critical for both primary and metastatic lesions. Reconstruction techniques and material selection are particularly important in cases requiring extensive resection such as rib+sternum resection.

KEYWORDS: Chest wall tumor, Benign, Malignant, Treatment, Reconstruction.

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INTRODUCTION

Chest wall tumors are rare, accounting for fewer than 2% of thoracic masses (1,2). Approximately 55% originate from bone or cartilage (1). Surgery plays a key role in treating these tumors, aiming to achieve wide tumor-free margins and, when necessary, reconstruct the resulting chest wall defect (3,4). Reconstruction techniques have become increasingly emphasized to maintain thoracic stability and protect intrathoracic organs, especially after large chest wall resections (5,6). This study evaluated the surgical approaches applied in chest wall tumors and their outcomes.

MATERIAL AND METHOD

Between 2000 and 2023, 170 patients followed at Atatürk University Faculty of Medicine, Thoracic Surgery Clinic, were retrospectively reviewed. Sixteen patients with incomplete data were excluded, leaving 154 patients in the final analysis. Demographic data, clinical findings, surgical methods, reconstructive materials used, pathology results, additional treatments, complications, and follow-up outcomes were obtained from hospital records.

Histopathological diagnoses were supported by immunohistochemical methods. Tumors were classified as benign or malignant and as soft tissue or bone-cartilage origin, according to the World Health Organization (WHO) classification.

Five patients with hydatid cyst required chest wall resection due to external invasion by the cyst. Each presented with a chest wall mass that was confirmed postoperatively on pathological examination, and albendazole therapy was subsequently administered.

Surgical procedures included soft tissue excision (simple excision, including periosteal excision when indicated), rib resection, rib+sternum resection. In cases of parenchymal invasion, wedge resection of the lung was also performed.

Ethical Committee

The study protocol was approved by the Ataturk University Institutional Review Board for Human Subjects Research and Ethics Committee (date: 25.10.2024, no: B.30.2.ATA.0.01.00/637).

Statistical Analysis

All statistical analyses were performed using SPSS version 22 (IBM, Armonk, NY, USA). Categorical variables were expressed as frequencies (n) and percentages (%), while continuous variables were given as mean ± standard deviation or median (minimum–maximum). The relationship between surgical methods and the need for reconstruction was assessed using the chi-square test ($p<0.05$ considered significant). Postoperative complication rates and additional therapy requirements were likewise compared according to the extent of resection. Additionally, the relationship between tumor size and malignancy was analyzed with the Mann–Whitney U test ($p=0.032$ for mean tumor diameter), while the difference in mean age between patients who did and did not develop complications was determined using Student's t-test ($p=0.041$).

RESULTS

Among the 154 patients, 92 (59.7%) were male and 62 (40.3%) were female, with a mean age of 42.39±19.44 (range: 1–84) years. The most common presenting complaints were swelling (60.3%) and pain (54.5%), which coexisted in 26.6% of patients **(Table 1)**.

Table 1: Distribution of clinical findings of patients

Clinical Findings	n	%
Swelling	93	60.3
Pain	84	54.5
Swelling and pain	41	26.6
Cough, weakness, weigh loss, sweating, etc., systemic complaints	9	5.8
No complaints	12	7.7

(Date are given as number (n) and percentage(%))

Tumors most frequently involved the right chest wall (46.7%). Based on radiological and clinical assessments, 13.6% of masses were smaller than 2 cm, 24.1% were 2–5 cm, and 62.3% exceeded 5 cm. As shown in **Table 2**, tumors were most commonly detected at the level of the seventh rib (8.4%), while the second, fourth, and sixth ribs were each involved in 7.1% of cases. Only 9 patients (5.7%) had a preoperative diagnosis of malignant mesenchymal tumor and received neoadjuvant chemotherapy (n=8) or radiotherapy (n=2). The most common surgical approach was soft tissue excision (37.6%), followed by rib resection (29.8%) and rib+sternum resection (16.8%) **(Table 3, Figure 1 and 2)**. Wedge resection of the lung (1.9%) was performed in cases of intrathoracic invasion by the mass.

Table 2: Costa levels of the masses

Costa Levels	n	%
1st rib level	2	1.2
2nd rib level	11	7.1
3rd rib level	8	5.1
4th rib level	11	7.1
5th rib level	9	5.8
6th rib level	11	7.1
7th rib level	13	8.4
8th rib level	10	6.5
9th rib level	5	3.2
10th rib level	4	2.5
11th rib level	4	2.5
12th rib level	1	0.6

Table 3: Distribution of surgical methods

Surgical Methods	N	%
Excisional biopsy	17	11
Soft tissue excition	58	37.6
Rib resection	46	29.8
Mass excision+ rib resection	8	5.1
Rib + sternum resection	26	16.8
Wedge resection	3	1.9

(Date are given as number (n) and percentage(%))

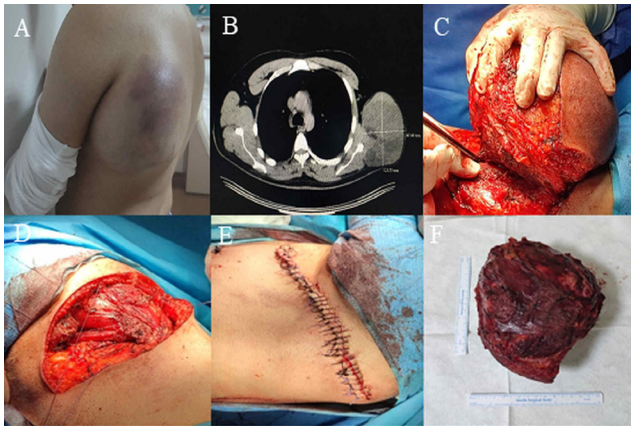

Figure 1: A 31-year-old male patient presented with swelling in the left posterior axillary region for 7–8 months. Computed tomography (CT) demonstrated a mass (A, B). Tru-cut biopsy revealed a malignant mesenchymal tumor (undifferentiated pleomorphic sarcoma). The lesion was widely excised together with overlying skin (C–F), and the pathology report confirmed the biopsy diagnosis.

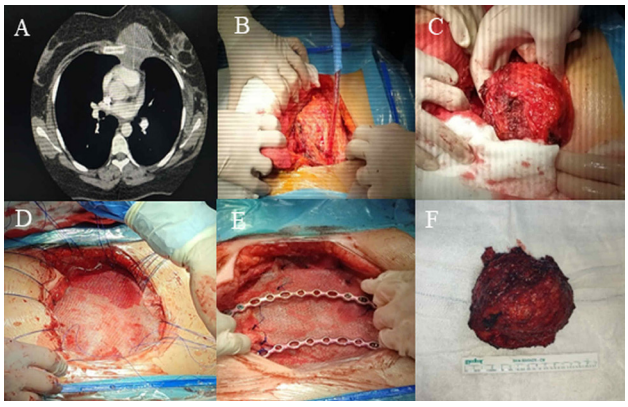

Figure 2 : A 28-year-old female patient, who had undergone surgery for breast cancer 3 years prior (with 8 cycles of adjuvant chemotherapy), was found on PET-CT to have a mass invading the left 2nd, 3rd, 4th, and 5th ribs and the sternum (A). The sternum was completely resected along with partial resection of the left 2nd–5th ribs (B, C, F). A double layer of polypropylene mesh and 4 plates was placed to reconstruct the chest wall (D, E). Pathological examination confirmed metastatic invasive ductal carcinoma.

Reconstruction was necessary in 20 patients (13%). Polypropylene mesh was used most often (8.3%), followed by the "sandwich" technique using methyl methacrylate plus polypropylene mesh (1.2%). Pericardial patches or plates were applied in other cases. Among 26 patients who underwent rib+sternum resection, 15 (57.7%) required reconstruction, indicating a significantly higher rate than for other surgical methods ($p<0.05$). Postoperative complications occurred in 7 patients (4.5%): hematoma (n=4), pleural effusion (n=2), and seroma (n=1). The average hospital stay was 5.7 days, and 82.4% of patients were discharged within one week. Histopathologically, 52% of tumors were benign and 48% were malignant. Of these, 62.3% were soft tissue in origin, while 37.6% were of bone-cartilage origin **(Table 4)**.

Table 4: Histopathological distribution of chest wall tumors

Histopathological Types	N	%
Adenocarcinoma	1	0.6
Arteriovenous malformation	1	0.6
Atypical mature cartilage tissue	3	1.9
Bening bone tissue	11	6.8
Bening mesenchymal tumor	5	3.1
Schwannoma	1	0.6
Dermatofibrosarcoma protoburens	3	1.9
Dermoid cyst	1	0.6
Desmoid type fibromatosis	3	1.9
Giant cell tumor	1	0.6
Elastofibroma dorsi	2	1.3
Eosinophilic granuloma	1	0.6
Epithelial tumor	1	0.6
Ewing sarcoma	3	1.9
Fibrous dysplasia	12	7.7
Fibrous histiocythoma	1	0.6
Hamartomatous lesion	1	0.6
Hemangioma	4	2.5
Hypernoma	1	0.6
Lymphoma	6	3.8
.Undiferentiated pleomorphic sarcoma	1	0.6
Intramuscular myxoma	2	1.2
Carcinoma metastasis	1	0.6
Keratinous cyst	5	3.2
Hydatic cyst	5	3.2
Chondroma	9	5.7
Chondrosarcoma	7	4.5
Lipoma	13	8.5
Malignant epithelial tumor (breast cancer metastasis)	4	2.5
Malignant fibrous histiocytoma	5	3.2
Malignant mesenchymal tumor	6	3.8
Malignant solitary fibrous tumor	3	1.9
Myxoid malignant peripheral nerve sheath tumor recurrens	2	1.3
Necrotizing granulomatous lymphadenitis	2	1.3
Nodular fasciitis	1	0.6
Osteochondroma	5	3.2
Plasma cell dyscrasia	2	1.3
Squamous cell tumor	3	1.9
Solitary plasmocytoma	2	1.3
No pathology	3	1.9

(Date are given as number (n) and percentage(%))

In 5 patients (3%) diagnosed with hydatid cyst, postoperative pathology confirmed chest wall involvement, and albendazole were administered. Negative surgical margins were achieved in 137 patients (89%), whereas 6 patients (3.9%) had positive margins. Recurrence was observed in 25 patients (16.2%): 14.2% intrathoracic and 1.8% extrathoracic. Nineteen of these patients had malignant tumors ($p<0.01$). Postoperative chemotherapy was administered to 25 patients

(16.1%), radiotherapy to 2 (1.3%), and chemoradiotherapy to 10 (6.4%). Patients with extensive resection or positive surgical margins had a higher incidence of adjuvant therapy ($p<0.01$).

DISCUSSION

Chest wall tumors represent a rare subset of thoracic lesions, comprising fewer than 2% of cases (1,2). About 55% originate from bone or cartilage (1). Surgical treatment aims to achieve negative margins and, when necessary, reconstruct the defect (3,4). Reconstruction has gained prominence to ensure thoracic stability, especially in extensive resections (5,6).

In this series of 154 patients, 52% had benign tumors and 48% were malignant, a distribution that aligns with many reports highlighting that nearly half of chest wall tumors can be malignant (7,8). The most common symptoms were swelling (60.3%) and pain (54.5%), which is consistent with the typical clinical presentation of chest wall masses (4). Lipomas and fibrous dysplasias emerged as the most frequent benign lesions, reflecting the prevalence of adipose tissue tumors and bone developmental abnormalities in this region (5,6).

An interesting finding was the presence of hydatid cysts in 5 patients. Although hydatid disease most commonly affects the liver or lungs, chest wall involvement while rare remains clinically significant when the parasitic infection breaches the thoracic cavity (9). Surgical excision followed by albendazole therapy is generally the recommended approach to minimize recurrence risk. This approach is supported by recent studies emphasizing the importance of complete cyst removal and prolonged antiparasitic therapy (10).

Chondrosarcoma is recognized as the most frequent malignant bone-cartilage tumor of the chest wall (6,8), and our findings echo this pattern: 4.5% of all tumors were diagnosed as chondrosarcoma. Notably, mesenchymal tumors and lymphomas represented the most frequently encountered malignant soft tissue lesions. Such malignant entities often demand multimodal treatment approaches, including surgery, chemotherapy, and radiotherapy, depending on stage and histopathology (11,12). Our approach to reconstruction particularly in patients requiring rib+sternum resection mirrors the necessity to maintain chest wall stability. Polypropylene mesh was the most commonly used material, while the "sandwich" technique (methyl methacrylate plus mesh) or rigid plates were reserved for larger defects. These methods have been documented to effectively restore structural integrity while reducing paradoxical chest wall motion (13,14). The fact that 57.7% of rib+sternum resection cases required reconstruction underscores the invasive nature of these tumors and the larger defect they leave behind.

One of the critical challenges in managing chest wall tumors is preventing local recurrence while minimizing postoperative complications (15,16). In the current study, the recurrence rate was 16.2%. Most recurrences were observed in malignant tumors, reflecting the aggressive nature of sarcomas, lymphomas, and other malignancies that can infiltrate locally or spread to adjacent structures. Importantly, the absence of complications in 95.5% of the cases is encouraging, suggesting that a multidisciplinary approach with timely recognition and management of hematomas, pleural effusions, and seromas can yield favorable perioperative outcomes. Larger tumor size (>5 cm) has been associated with increased malignancy in various series (12,15), and our findings support this. Consequently, achieving clear surgical margins is paramount to reduce recurrence, especially for high-grade lesions. In patients where negative margins could not be confirmed (3.9%), the role of adjuvant chemotherapy or radiotherapy became more pronounced, aligning with the concept that multimodal therapy is crucial when surgical resection alone cannot guarantee disease control (17,18).

Although our data span over two decades, during which surgical techniques and postoperative care have continuously evolved, our overall results remain consistent with modern series. Future perspectives may involve exploring advanced reconstructive materials or biologic meshes that can improve chest wall function while lowering infection rates. Additionally, more targeted chemotherapeutic or immunotherapeutic

agents might help reduce the risk of recurrence, particularly in high-grade malignancies (19,20). In summary, chest wall tumors, though uncommon, demand careful preoperative planning, meticulous surgical technique for margin clearance, and, when indicated, robust reconstruction strategies to prevent postoperative complications and maintain chest wall stability. Our findings underscore the importance of a multidisciplinary approach and vigilant follow-up to monitor for any evidence of recurrence. With ongoing advances in surgical oncology, it is expected that future outcomes may further improve, particularly if diagnosis occurs at earlier stages and if new reconstructive technologies become widely available.

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