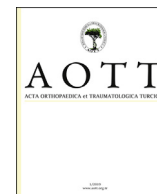


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Acta Orthopaedica et Traumatologica Turcica

journal homepage: <https://www.elsevier.com/locate/aott>

Prevalence of elastofibroma dorsi on CT: Is it really an uncommon entity?

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ARTICLE INFO

Article history:

Received 16 November 2017

Received in revised form

19 May 2018

Accepted 5 April 2019

Available online 25 April 2019

Keywords:

Elastofibroma dorsi

Prevalence

Chest CT

Laterality

Soft tissue neoplasms

ABSTRACT

Objective: The aim of this study was to determine the prevalence, demographic data of elastofibroma dorsi (ED) in adult population who had undergone chest CT examination and to discuss clinical, and radiological presentations, and treatment options of ED.

Methods: We retrospectively reviewed 4074 chest CT examinations for ED from July 2014 to April 2015. Lesion size, side, and patient demographics were analyzed for positive cases of ED. The initial radiology reports of patients with ED were also reviewed.

Results: Of the 4074 patients, 111 patients (2.73%) (77 women and 34 men; mean age: 68.2 years; range: 35–91 years) had a total of 168 ED. The females had a 1.96-fold higher prevalence of ED than the males (OR, 1.96; 95% CI, 1.481–2.59). The mean lesion thickness was found to be significantly greater in the female patients compared with the male patients ($p = 0.001$). The prevalence of the disease was estimated to be 4.98 times higher in patients aged 65 years or older (CI 95%, 3.25–7.36). In 111 ED patients, the lesions were only noted in 9 patients' initial radiology report.

Conclusion: Here, we present a prevalence study with the largest population in the literature concerning ED. Our study shows that ED is not as uncommon as previously thought and should be especially suspected in females and older age groups.

Level of Evidence: Level IV, Diagnostic Study.

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Introduction

Elastofibroma dorsi (ED) is a rare, benign soft-tissue pseudotumoral mass, characterized by the proliferation of fibrous and adipose tissue around the lower angle of the scapula between the thoracic wall, serratus anterior and latissimus dorsi muscle. Most individuals with ED remain asymptomatic, and the condition is unrecognized. Although it is benign in nature, ED can cause symptoms such as a clicking sensation, scapular snapping, stiffness, pain in the scapular region, and cosmetic problems.^{1–3} On physical examination, small-sized lesions can go unnoticed. When lesions reach a certain size,

the tumor becomes palpable and visible. Placing the patient in a standing position with arms slightly elevated forward and adducted can make tumor visible and palpable on physical examination.⁴ The differential diagnosis of ED includes lipomas, neurofibromas, dermoids, and malignant fibrous histiocytoma.^{1,4}

Although ED is encountered rarely in medical clinics, autopsy series have shown a higher prevalence. In a series of 235 autopsies, Jarvi and Lansimies found ED in 24.4% of women and 11.2% of men over 55 years old.⁵

In the literature, imaging features of ED are well established.⁶ Evidence of typical location and characteristic MRI and CT findings in ED can obviate the need for any further diagnostic work-up.⁷ Although case-based studies and articles describing imaging findings in the context of ED in small series do exist in the literature, we only found a single study that describes the prevalence, imaging and demographic characteristics of ED in a relatively small asymptomatic patient population.⁸ In this study, we aimed to characterize the prevalence together with the clinical and imaging

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Peer review under responsibility of Turkish Association of Orthopaedics and Traumatology.

Table 1
Reasons for exclusion.

	Number of excluded patients
Examination without contrast media	243
Trauma-surgery related changes in thoracic wall	11
Insufficient image quality	3
Thoracic wall metastasis or invasion	10
Excessive chest wall edema	8
Total	275

features of ED in a large population of asymptomatic patients who had undergone CT examination for another reason.

Materials and methods

This study was approved by the local institutional review board, which waived the requirement for patient informed consent. Two radiologists retrospectively reviewed all 4349 chest CT examinations of patients older than 18 in our department between July 2014 and April 2015. The indications for chest CT examination differed widely (lung cancer, staging other tumors, infection, etc.). Of the 4349 patients, 275 were excluded from the study for various reasons (Table 1). A final total of 4074 patients were included in the study group. Of these patients, 1659 were women and 2415 were men with a mean age of 56.46 years (range, 18–91 years).

Contrast-enhanced multi-slice chest CT examinations were performed using the Toshiba Aquilion 64 (Toshiba Medical Systems). Images were obtained at full inspiration during the arterial phase using a 64 × 0.50 mm slice collimation with a tube voltage of 120 kV, 1.5 pitch, 70–90 mAs. The reconstruction slice thickness was 3–5 mm and the general reconstruction planes comprised axial, sagittal and coronal views.

Two radiologists evaluated CT scans for periscapular lesions, reaching a consensus in each case. Characteristic imaging findings (typical location of the lesion, similar attenuation with adjacent muscle) were considered diagnostic for ED. Patient demographics, lesion side and, lesion size were also evaluated. Only the lesion thickness in the axial plane was measured because lesion contours were indistinct in other dimensions (Fig. 1). The original radiology report of patients with ED was also reviewed to clarify whether the lesion was had been reported in the first evaluation.

Statistical analysis

Categorical variables were expressed as percentages. Numerical variables were evaluated for normality of the data distribution

using the Shapiro–Wilk test. Independent samples t-test was performed to compare the means of two groups. The Mann Whitney U test was used to compare two groups of non-parametric data. Pearson's correlation coefficient was used to determine the linear relationship between two variables. Spearman's correlation coefficient was used to determine the correlation between two non-parametric variables. Pearson's chi-squared statistic was used for group-to-group comparisons. A p-value of <0.05 indicated a statistically significant difference. Receiver Operating Characteristics (ROC) analyses were used to determine optimal cut-off values. Statistical analyses were performed using computer software (Statistical Package for Social Sciences, Version 20.0, SPSS Inc., Chicago, Illinois, USA).

Results

In 4074 patients, we found 111 patients (2.73%) to have a total of 168 ED; 54 patients (48.6%) had unilateral lesions (28 on the right side, 26 on the left) and 57 patients (51.4%) had bilateral lesions. In patients with ED, there were 77 women and 34 men, with an age range of 35–91 years (mean age, 68.2 years). The mean age was 68.8 years (range, 44–91 years) in the female patients and 66.9 years (range, 35–86) in the male patients (Fig. 2).

ED was significantly more common in female patients versus male patients ($\chi^2 = 38.795$, $p < 0.05$) (Table 2). Females had a 1.96-fold higher prevalence of ED than males (OR, 1.96; 95% CI, 1.481–2.59). There was no statistically significant difference in the mean age between female and male patients ($p = 0.40$). In 57 patients with bilateral disease, ED was found to be significantly more common in female patients ($\chi^2 = 7.083$, $p = 0.029$).

When all lesions were considered separately, we found the mean lesion thickness to be 10.38 mm (range 4–43 mm). The mean lesion thickness in females and males was 11.27 mm (range, 4–43 mm) and 7.96 mm (range, 4–19 mm), respectively. The mean lesion thickness was found to be significantly greater in female versus male patients ($p = 0.001$) (Table 2). The mean thickness of the right-sided and left-sided lesions was 11.04 mm and 9.71 mm, respectively. There was no significant difference in the mean lesion thickness between the right-sided lesions and left-sided lesions ($p = 0.91$). The mean lesion thickness was found to be significantly greater in patients with bilateral disease compared with those having unilateral disease (for the right side $p = 0.007$, for the left side $p = 0.005$) (Table 3). While the mean lesion thickness was correlated positively with patient age for the right-sided lesions ($p = 0.033$), there was no correlation between the mean lesion thickness and patient age for the left-sided lesions ($p = 0.071$).

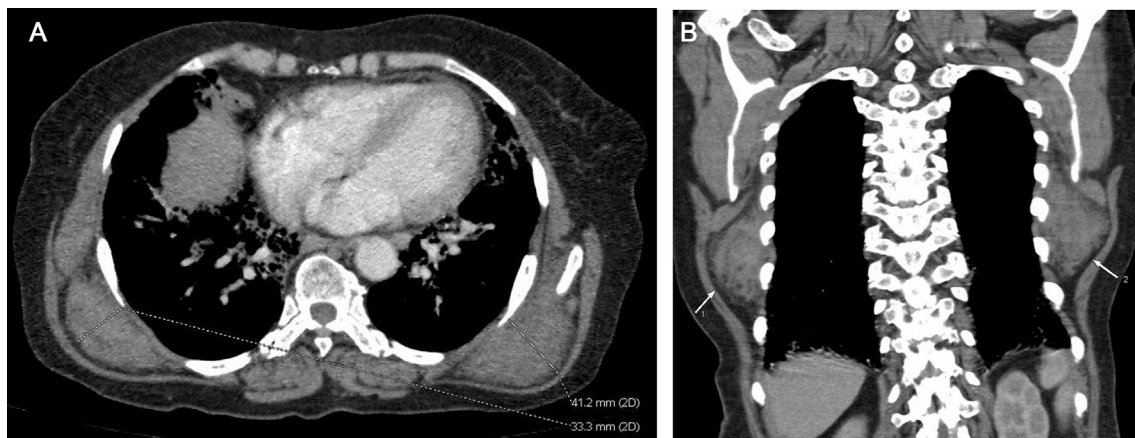


Fig. 1. Axial (A) and coronal (B) CT image of a 67-year-old woman with bilateral large ED (arrows). Lesion thickness was measured in the axial plane as shown in Fig. 1A.

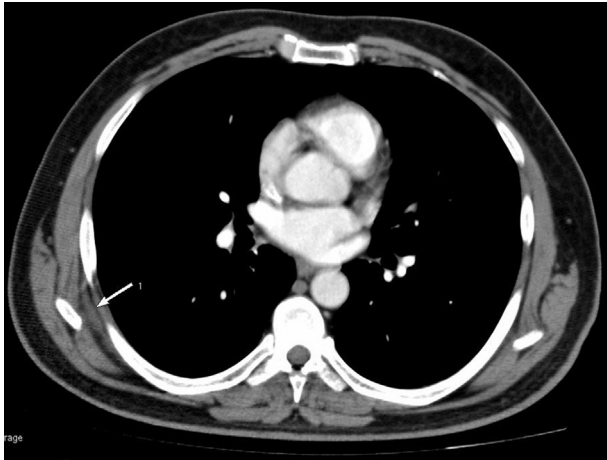


Fig. 2. Axial CT image of a 52-year-old man with a right-sided small ED (arrow). The left side is normal.

The mean age of patients with and without ED was 68.2 years (range, 35–91) and 56.1 years (range, 18–90), respectively. In this study, 77 of 111 patients with ED were 65 years of age or older. In 65 years of age or older patients, prevalence of ED calculated as 5.8%. The prevalence of the disease was estimated to be 4.98 times higher in patients aged 65 years and older (CI 95%, 3.25–7.36). The mean age of patients with bilateral and unilateral lesions was 67.23 and 69.31, respectively. There was no significant difference between the mean age of patients with bilateral and unilateral lesions ($p = 0.32$).

The original radiology report of each patient was reviewed. In the 111 ED-positive patient group, we determined that the disease had been reported at the first radiological evaluation only in nine patients (8.0%). For these nine patients, the mean thickness of the lesions was 19.69 mm, which was significantly larger than the mean thickness measured in the remaining ED-positive patients (9.40 mm). The mean thickness of the lesions which were reported in the first radiological evaluation was found statistically significantly larger than the mean thickness of those which were not reported ($p < 0.05$).

Discussion

The term of ED defines a benign, pseudotumoral, fibroadipous, non-neoplastic proliferative lesion which was first introduced by Jarvi and Saxen in 1961.⁹ ED typically occurs around the inferior scapular tip in the thoracic wall, between the serratus anterior and latissimus dorsi muscle; however, elastofibroma affecting other locations (hand, foot, and olecranon) has also been reported.¹⁰ Histopathologic features of ED are composed of hyalinized collagen, fibroblasts, mature adipose tissue, and no mitoses.^{5,9} The pathogenesis of ED is still unclear but hereditary and constitutional factors are considered as relevant. In a series of 170 clinicopathologic

cases, Nagamine et al found that the majority of cases had a family history.¹⁰

CT and MRI are particularly effective in the diagnosis of ED. Lesions containing interspersed streaky fat and fibrous components in the typical periscapular location can provide definitive diagnosis on CT and MRI. Fatty tissue generates low density in CT, and high signal intensity on T1 and intermediate signal intensity on T2 by MRI. Fibrous tissue generates a similar density to muscle by CT and similar intensities both on T1 and T2 by MRI.¹¹ Ultrasound can also add diagnostic value to the radiologic identification of ED.¹²

The treatment of ED is a complete excision of the tumor. Surgery is recommended if the lesion causes physical and psychological symptoms. Excision of an asymptomatic ED lesion is not recommended because malignant transformation has not yet been described. The most frequent postoperative complications include seroma, hematoma and wound infections.^{1,13}

Brandser et al retrospectively studied the chest CT examination of 258 patients over 60 years old and reported the prevalence of ED as 2%.⁸ In our study, we found the prevalence of ED 2.73% in a patient population older than 18 years old. Among patients older than 65 years the disease prevalence increased significantly (5.8%). In the present study, we found that the prevalence of the disease was higher than reported in previous radiological studies.

In 1975, in a series of 235 autopsies, Jarvi and Lansimies found an ED prevalence of ED 16% which is significantly higher than our results.⁵ Although lesion size was not mentioned in that study, the authors reported that many lesions only had streaks of abnormal elastic tissue. We think that this difference of prevalence between radiological and autopsy studies can be explained by some small lesions detected in autopsies that are below the resolution of the CT examination.

Some studies have suggested that unilateral disease was more common than bilateral disease^{4,14}; on the contrary, the current study did not find any significant difference between the prevalence of the unilateral and bilateral disease. Similar to previous reports, we found that ED was significantly more common in women than in men.^{5,13}

In this study, lesion thickness was found to be significantly greater in women than in men and greater in patients with bilateral lesion than in those with unilateral lesion. We also found a strong correlation between lesion thickness and patient age for the right-sided lesions and no correlation for the left-sided lesions. To the best of our knowledge, this information was not given in previous studies.

In the literature, ED is thought to be more common on the right side, presumably because most individuals are right-hand dominant.¹⁵ In our study, no significant difference was found in terms of the number of right-versus left-sided lesions, which is similar to the result of more recently published study.¹⁶ We also found no significant relation between the mean lesion thickness and lesion side.

In 111 ED-positive patients, this was only mentioned in 9 initial patient reports. Although ED is easily recognized in CT examination,

Table 2

The relationship between patient's gender, lesion site and lesion thickness.

	Female	Male	Total	OR or p value
Number of unilateral ED (+) patients	77	34	111	1.96 ^a
Mean age (y)	68.8	66.9	68.2	0.40 ^b
Number of bilateral ED (+) patients	46	11	57	0.029 ^b
Mean lesion thickness (mm)	11.27	7.96	10.38	0.001 ^b

^a Odds ratio (OR).

^b p value.

Table 3

The relationship between lesion thickness and lesion site.

		Number of Patients	Mean	Minimum	Maximum	p value
Right-sided lesion thickness (mm)	Unilateral	28	8.61	5	19	0.007
	Bilateral	57	12.23	4	35	
Left-sided lesion thickness (mm)	Unilateral	26	7.23	4	13	0.005
	Bilateral	57	10.84	4	43	

the diagnosis was often missed in the initial interpretation similar to other studies.^{8,15}

This study has some limitations, one of which is the lack of histopathologic proof in the patients. Another limitation is that the patients were not followed up clinically and radiologically.

To conclude, in this paper, we presented some epidemiologic aspects and demographics of ED in largest patient population in the literature. Evidence of ED in imaging examinations is not uncommon, as previously thought to be true, especially for the older and female patient population. Awareness of this entity may also obviate the need for any further diagnostic work-up.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Disclosure of interest

The authors declare that they have no competing interest.

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