

# Nuchal-type Fibroma Induced by Repetitive Trauma from Weightlifting: Case Report and Comprehensive Review of Literature

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**Summary:** A nuchal-type fibroma (NTF) is a rare, benign, subcutaneous nodule that most frequently occurs in the posterior neck along the midline. It is characterized histologically by bundles of thick collagen fibers confined to the dermis and subcutaneous tissue of the posterior neck. Few trauma-related NTF cases have been published. We present a biopsy-proven case of NTF that is likely to have developed as a result of weightlifting activity in the gym, including repetitive trauma to the area of the lesion during the exercise known as the “barbell back squat.” During this exercise, a heavy barbell was repeatedly rested on the patient’s vertebral prominence at the level of C7/T1, the location where the NTF developed. Our 25-year old patient reported that he had been doing this exercise on a weekly basis for about 10 years. We believe that repetitive trauma at this location from specific weightlifting exercises may attribute to the incidence of NTF. A description of key magnetic resonance imaging characteristics and the surgical pathology of this case are provided, along with a review of current literature on trauma-related NTFs. (*Plast Reconstr Surg Glob Open* 2024; 12:e5517; doi: [10.1097/GOX.0000000000005517](https://doi.org/10.1097/GOX.0000000000005517); Published online 10 January 2024.)

## INTRODUCTION

A nuchal-type fibroma (NTF) represents a rare, fibrocollagenous lesion that most commonly arises in the cervicodorsal neck region, but may occur in extra nuchal soft tissue sites such as the upper back, shoulder, and facial regions as well.<sup>1</sup> The lesion typically occurs in the nuchal and interscapular regions of patients between the ages of 20 and 60 years.<sup>2</sup> The lesion is benign but does have potential for recurrence. It is characterized as a benign pseudotumor with hypocellular bundles of collagen interspersed with fatty tissue and only a few fibroblasts.<sup>2,3</sup> It was first described in 1988 by Enzinger and Weiss.<sup>3</sup> Since then, there has been an emergence of associations with diabetes mellitus, scleroderma, and Gardner’s syndrome.<sup>2,4-6</sup> Trauma has also been suggested as another cause.<sup>7-10</sup> The incidence of NTF has a strong male predominance.<sup>11</sup>

We present the imaging features and histological findings of an NTF. It is one of the few reported cases of a fibroma in the nuchal region that is believed to have been acquired due to repetitive high pressure trauma. Lesions such as the one in this case may not be as uncommon as the medical literature indicates, and the increasing popularity of specific exercises in weightlifting activity may increase the prevalence of this condition and demonstrate the importance of greater clinical awareness.

## CASE REPORT

A 25-year-old male presented to the plastic surgery department with a firm, rigid, painless mass on his posterior neck in the midline C7 region. The patient, having become aware of this lesion about 2 years prior, reported that he believed that the mass had been slowly growing in that time period.

Clinical examination of the mass demonstrated an ellipsoid shaped solid mass superficial to the C7 spinous process along the midline (Fig. 1). The lesion was mildly tender to palpation with minimal surrounding erythema. The patient did not have any restriction of movement. A neurologic evaluation was performed and did not demonstrate any dysfunction. At this point, a large differential diagnosis was considered, including potential entities such as lipoma, Gardner fibroma, elastofibroma, and solitary fibrous tumor.

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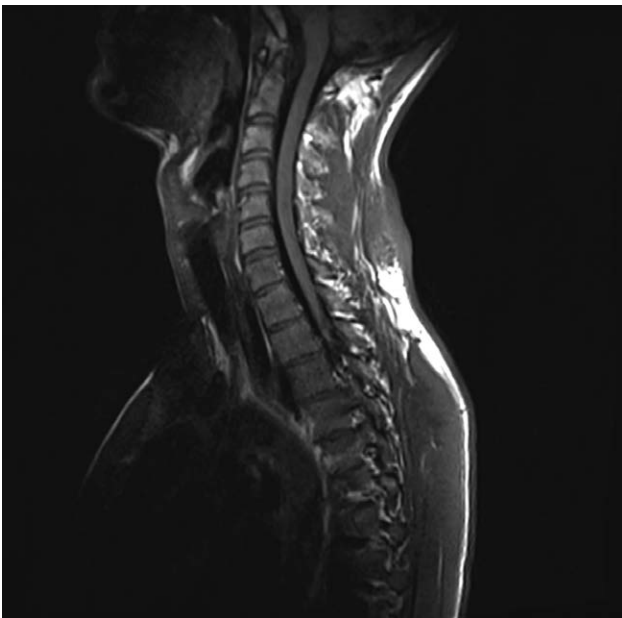
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**Fig. 1.** Posterolateral view of mass.



**Fig. 2.** MRI T1 sagittal flair.

Magnetic resonance imaging (MRI) of the cervical spine with and without contrast (Fig. 2) was performed and demonstrated the ovoid shaped 5×1.2×3.2cm soft tissue mass within the posterior cervical subcutaneous soft tissues at the site of the palpable lump. There was no significant enhancement. There was some overlying skin thickening noted. The mass was characterized as somewhat heterogenous in appearance. It did not infiltrate into the surrounding soft tissues and did not contain any hemorrhage component on the T2 gradient echo axial sequence. The interpreting radiologist noted that the lesion most likely represented a benign solid tumor mass such as a hemangioma but recommended tissue sampling

### Takeaways

**Question:** Can repetitive trauma on the posterior neck from specific weightlifting exercises result in development of nuchal-type fibromas in the region?

**Findings:** Our case report, as well as two similar weightlifting-related cases noted in literature, point to the high likelihood that specific weightlifting exercises could induce a process resulting in the development of nuchal-type fibromas.

**Meaning:** Weightlifting-related repetitive trauma is likely a mechanism by which nuchal-type fibroma development could occur, and with the popularity of these exercises, clinicians would benefit from gaining awareness of this possibility moving forward.

with needle biopsy due to remote possibility of a malignant lesion.

After completion of MRI, the patient was further evaluated by a plastic surgeon who recommended further investigation with biopsy of the mass to obtain pathological diagnosis. The patient preferred to move forward with complete excision of the mass for proper comprehensive evaluation.

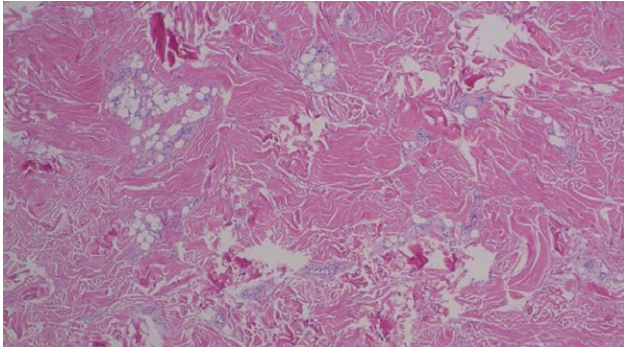
Intraoperatively, an incision was made in the midline over the most prominent area of the mass. There was no discernable plane that could be identified between the skin and the mass. The mass was noted to be white, rubbery, firm and solid, and densely adherent to the skin and underlying fascia. A frozen section was obtained before proceeding, and it demonstrated benign tissue consistent with a dense collagenous mass. Therefore, to minimize skin loss, a #10 scalpel was used to create a plane which separated the mass from the subdermis. Once complete, the undersurface of the mass was sharply excised from the muscle. The skin and subcutaneous tissue was able to be closed primarily with only a small potential space. No drain was placed. The deep tissues were closed with #1 Vicryl. The skin was closed with a few #1 Nurolon vertical mattress sutures to relieve tension, 3-0 Monocryl in the dermis, and running 3-0 Ethilon for the skin.

Grossly, the mass consisted of a rubbery, tan-pinkish piece of soft tissue. Sectioning revealed a tan-grayish rubbery cut surface without a distinct localized lesion. Microscopically, the sections showed a paucicellular lesion composed of dense hyalinized collagen surrounding fat spaces, seen in Figure 3, and nerve twigs, seen in Figure 4. There was no evidence of malignancy. These features were consistent with a diagnosis of an NTF.

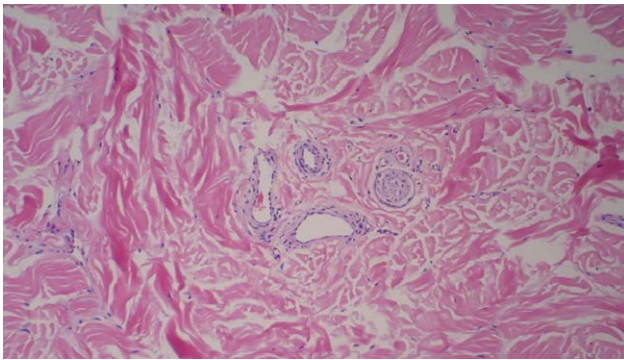
The patient tolerated the surgery without complication and made a full recovery. He was followed up at 1 month postoperatively and was noted to be healing well. Postoperative photos from both 1 day after the procedure (Fig. 5) and 1 month after the procedure (Fig. 6) are included below. He was again followed up after 1 year with no recurrence or issues noted.

### DISCUSSION

NTFs are benign pseudotumors typically composed of abundant, haphazard collagen with a predilection for the



**Fig. 3.** Low-power H&E-stained section showing paucicellular lesion composed of abundant thick collagen bundles surrounding and entrapping fat spaces.



**Fig. 4.** Higher power H&E-stained section showing entrapped blood vessels and a nerve.



**Fig. 5.** One-day postoperative photograph.



**Fig. 6.** One-month postoperative photograph.

posterior neck, but can also infrequently be found in the upper back, extremities, and face. They have a significant male predominance and are typically found in patients between the ages of 20 to 60 years. Up to one-half of patients with NTFs also have diabetes.<sup>11</sup> There is an association found in patients with scleroderma as well.<sup>5</sup>

A complete clinical history and workup as well as microscopic histologic findings are necessary to differentiate NTFs from other entities that are likely to be included in an initial differential diagnosis such as Gardner fibroma, elastofibroma, fibrolipoma, and solitary fibrous tumor.

With regard to the initial workup for our patient, it was noted that there were a multitude of key features of the patient's history and of this mass which warranted concern for possible malignancy. Clinical criteria that warrants further investigation for potential malignancy include a duration of presence of mass for longer than 2 weeks, a size of mass greater than 1.5 cm, and a firm texture to palpation with reduced mobility.<sup>12</sup> As our patient met these criteria, further workup with imaging and biopsy was recommended.

The imaging modality of choice for our case was MRI of the cervical spine with and without contrast due to its advantage of outstanding soft tissue differentiation as well as its ability to identify both hypervascular and necrotic areas within the mass. MRI also provided the best definition for evaluating tumor size and extent of involvement to surrounding structures.

Gardner fibromas can be almost identical to NTFs histologically, as they are similarly composed of a hypocellular, dense collagenous matrix with entrapped adipose cells, as seen in NTFs. Gardner fibromas, however, are associated

with Gardner syndrome, a subtype of the autosomal dominant condition familial adenomatous polyposis.<sup>6,13</sup> Patients with Gardner fibroma are typically under the age of 10 and have a family history of or diagnosis of familial adenomatous polyposis, differentiating these patients from those with NTFs. Gardner syndrome-associated fibromas also typically lack the nerve elements and lobulated arrangement of collagen bundles seen in NTFs.<sup>10</sup>

The other entities in the differential are more easily differentiated from NTFs based on histology and location of lesions. Elastofibromas can be differentiated from NTFs based on their location predominantly arising near the inferior border of the scapula as well as microscopic findings of dystrophic, “beaded” elastic fibers within the lesion.<sup>2,11</sup> Fibrolipomas are typically well circumscribed as opposed to the unencapsulated, poorly circumscribed nature of NTFs. A solitary fibrous tumor would contain a greater composition of cellularity than the paucicellular NTF.<sup>11</sup>

Our particular case of NTF is of significant interest due to the pathogenesis of the lesion. It is thought that our patient’s mass developed as a consequence of repetitive trauma from weightlifting activity. Review of literature regarding repetitive trauma-induced NTF in the posterior neck region reveals only a small number of cases. The goal of our literature search for this report was to incorporate a comprehensive review of previously published resources regarding pressure induced fibroma development in the posterior cervical region. This review aimed to systematically look into prior similar cases in this area as well as to identify existing gaps in knowledge within the medical community at large. Our search strategy first incorporated the phrases “nuchal fibroma” and “extra-nuchal fibroma” to identify all previously published works on this entity in general. We then specifically aimed to zero in on those cases that were deemed to be specifically associated with pressure induction by adding in search criteria key words such as “force,” “pressure,” and “trauma” to our original search criteria. Finally, although examining all pressure-induced fibroma development was useful to us, we were most interested in focusing specifically on the posterior cervical region because this area was most relevant to our

proposed mechanism of pathological development in our particular report. Therefore, we added in the key phrase “posterior cervical fibroma” to locate the most relevant literature to our specific case.

Amongst the literature we examined were two case reports demonstrating very similar findings to our patient, in which it is believed that NTF development was the result of repetitive trauma from specific weightlifting exercises in which a heavy barbell was rested on the region where the NTF formed.<sup>8,10</sup>

Additionally, a case series had previously examined a trauma-induced phenomenon evaluating a group of Taiwanese patients who experienced years of repetitive blunt trauma to their shoulders from weight-bearing palanquins during religious dance performances, ultimately resulting in the development of NTFs on their shoulders.<sup>9</sup> This particular case series, published in 2016, included a well-organized table documenting the literature review of trauma-associated NTFs up to that point in time. As an update to their literature review, we have included the table here (Table 1), with the addition of our report, as well as the additional cases that have been published since 2016.

The exercise that is believed to have caused the lesion in both our case and in the other weightlifting-related cases noted above is the barbell back squat (Fig. 7). This is a compound exercise that activates muscle groups throughout the lower body, including the hamstrings, glutes, and lower back muscles. During the exercise, a barbell that can be loaded with heavy weights is placed across the back of the shoulders, slightly below the rear deltoids to achieve proper technique. The weightlifter then descends while pushing their hips posteriorly into a squatted position and then drives back up through their heels while extending their hips and knees to return to the starting, upright position.

We propose that the repetitive force induced by the placement of the bar on our patient’s posterior neck caused a pressure-induced reactive fibromatosis that led to the development of the NTF. The patient reported that he had been doing this exercise weekly for about 10 years and believed that the bar had been placed over the area where the mass had formed. He also reported that the skin over the area of the lump would sometimes become tender for a couple of days after his back squat workouts.

**Table 1. Literature Review of Trauma-associated NTF**

Source	Age (y)/		Size (cm)	Location	Duration	Trauma Type	GS	DM	Scleroderma
	Cases	Sex							
Banney et al <sup>14</sup>	1	53/M	NR	Posterior neck	30 years	Organic solvent exposure	NR	NR	Yes
Karonidis et al <sup>15</sup>	1	38/M	3.5	Posterior neck	Several years	NR	No	No	No
Sraj et al <sup>16</sup>	1	20/M	6.0	Ankle	5 years	Sustained minor contusion	NR	NR	NR
Linos et al <sup>1</sup>	1	54/M	4.8	Buttock	>2 years	Surgeries; medical problems	Yes	No	No
Lee et al <sup>9</sup>	7	21 to 32/M	From 7.5 x 7.0 to 12 x 10	Right shoulder <sup>8</sup> ; left shoulder <sup>7</sup>	4–12 years	Repetitive blunt trauma	No	No	No
Goldberg et al <sup>10</sup>	1	17/M	3	Right upper back	NR	Repetitive blunt trauma; weightlifting related	No	No	No
Jayaram et al <sup>8</sup>	1	34/M	5 x 3	Posterior neck	A few years	Repetitive blunt trauma; weightlifting related	No	No	No
This study	1	25/M	5 x 1.2	Posterior neck	2–3 years	Repetitive blunt trauma; weightlifting related	No	No	No

M, male; F, Female; GS, Gardner syndrome; DM, diabetes mellitus; NR, not reported.



**Fig. 7.** Animation of barbell back squat.<sup>17</sup> Used with permission.

The management and treatment of nodules such as the one in our patient may involve surgical removal of the lesion, as was performed in this case. Spontaneous regression has also been described as a possibility with removal of the traumatic stimulus. Patient education on proper exercise technique and barbell placement as well as the use of padding on the bar may provide protection and act as preventative measures.

While a medical literature search for nodules developing as a result of weightlifting revealed only a paucity of prior cases, photographs of similar appearing masses have appeared on several weightlifting and bodybuilding online forums with questions pertaining to the cause of such “lumps.”<sup>18,19</sup> It is likely that the formation of these lesions as a result of weightlifting exercise are not as uncommon as the current medical literature would indicate.

In conclusion, this case illustrates an NTF that was likely induced by repetitive trauma from pressure induced during weightlifting exercise. Although the medical literature on pressure induced NTFs in the posterior neck region is limited at this time, we believe that with the growing popularity of weightlifting activity worldwide, the development and specific pathogenesis of similar lesions are not as rare as the literature suggests and that it would be useful for clinicians to gain greater awareness and expand their knowledge regarding the possibility of this process moving forward.

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#### DISCLOSURE

*The authors have no financial interest to declare in relation to the content of this article.*

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