

## Troisier sign and Virchow node: the anatomy and pathology of pulmonary adenocarcinoma metastasis to a supraclavicular lymph node

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### ABSTRACT

Metastatic spread of cancer via the thoracic duct may lead to an enlargement of the left supraclavicular node, known as the Virchow node (VN), leading to an appreciable mass that can be recognized clinically — a Troisier sign. The VN is of profound clinical importance; however, there have been few studies of its regional anatomical relationships. Our report presents a case of a Troisier sign/VN discovered during cadaveric dissection in an individual whose cause of death was, reportedly, chronic obstructive pulmonary disease. The VN was found to arise from an antecedent pulmonary adenocarcinoma. Our report includes a regional study of the anatomy as well as relevant gross pathology and histopathology. Our anatomical findings suggest that the VN may contribute to vascular thoracic outlet syndrome as well as the brachial plexopathy of neurogenic thoracic outlet syndrome. Further, the VN has the potential to cause compression of the phrenic nerve, contributing to unilateral phrenic neuropathy and subsequent dyspnea. Recognition of the Troisier sign/VN is of great clinical importance. Similarly, an appreciation of the anatomy surrounding the VN, and the potential for the enlarged node to encroach on neurovascular structures, is also important in the study of a patient. The presence of a Troisier sign/VN should be assessed when thoracic outlet syndrome and phrenic neuropathy are suspected. Conversely, when a VN is identified, the possibility of concomitant or subsequent thoracic outlet syndrome and phrenic neuropathy should be considered.

### Keywords

Anatomy; Lung Cancer; Metastasis; Supraclavicular Node; Virchow; Troisier; Thoracic Outlet Syndrome

### INTRODUCTION

The Troisier sign represents an enlargement of a left-sided supraclavicular lymph node. The enlarged supraclavicular lymph node is known as a Virchow node (VN), Troisier node, or Virchow-Troisier node.<sup>1</sup> The eponyms “Troisier” and “Virchow” acknowledge the individuals who identified the enlargement of

supraclavicular nodes as a clinical sign of gastric cancer metastasis in the mid-to-late 19<sup>th</sup> century.<sup>2,3</sup>

The VN has been well-established as a signal node for the spread of gastric cancer.<sup>4-9</sup> In addition, the VN has been identified as a seeding location for cancers arising from myriad locations apart from

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the stomach, including the intestines,<sup>7</sup> urogenital system,<sup>10-18</sup> esophagus,<sup>19</sup> common bile duct,<sup>20</sup> liver,<sup>21-23</sup> as well as the pancreas,<sup>24,25</sup> and lungs.<sup>26</sup> The VN has also been reported with squamous cell carcinoma and lymphoma.<sup>16,27,28</sup> Furthermore active tuberculosis has manifested as a VN.<sup>29</sup> Even a hydatid cyst has been reported to masquerade as a classic VN.<sup>30</sup> Because of its diverse etiology, the Virchow node holds clinical significance for many medical specialties.

Outside of its role as a signal node, the VN may, itself, cause signs and symptoms from its mass effect; the VN may lead to Horner syndrome.<sup>31</sup> Therefore, its regional anatomy holds particular clinical significance.

Despite the clinical significance of the VN, only a few studies have been performed regarding its regional anatomical relationships. Our report describes a case of a VN discovered during cadaveric dissection and found to arise from an antecedent pulmonary adenocarcinoma. The report includes anatomical studies as well as relevant gross pathology and histopathology.

## CASE REPORT

An enlarged left-sided supraclavicular lymph node, or Virchow node (VN), was observed during neck dissection of a 68-year-old white female cadaver, whose cause of death was recorded as chronic obstructive pulmonary disease.

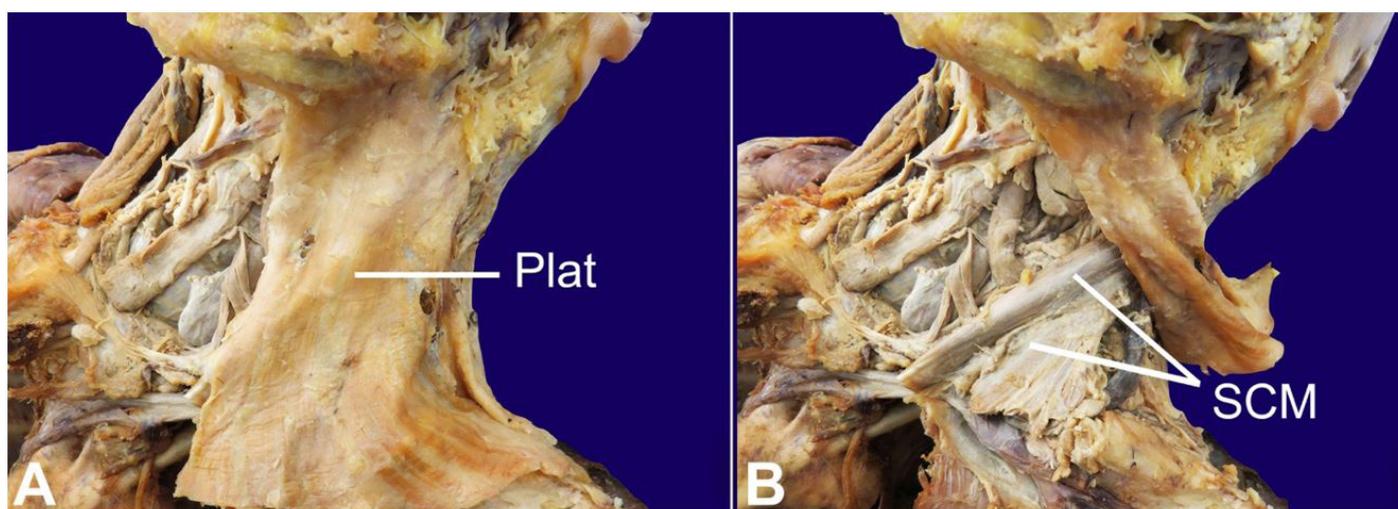
## ANATOMIC DISSECTION

Dissection revealed an enlarged left supraclavicular lymph node situated at the jugulo-subclavian venous junction (venous angle), a typical location for a VN (Figures 1 and 2). The VN, measured with a digital caliper (Mitutoyo 0-8 in (0-203.2mm) ABSOLUTE™ digimatic caliper series 500), was 3.7 × 2.4 × 1.4 cm.

The VN was deep to the platysma and clavicular head of the sternocleidomastoid muscle, underlying what would otherwise be considered the lesser supraclavicular fossa (Figure 2). Also, the superior pole of the VN was under the inferior aspect of the superior omohyoid muscle at its attachment with its intermediate tendon (Figure 3). The VN was located immediately lateral to the internal jugular vein and, along with the thoracic duct, was located just superior to the subclavian vein (Figure 3). Underlying the VN was the phrenic nerve, transverse cervical artery, and anterior scalene muscle.

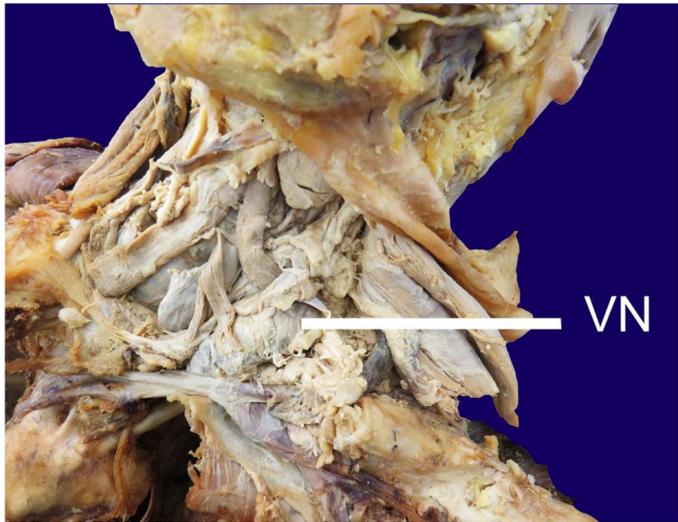
The VN was resected and macroscopically assessed, revealing that the node was enlarged by tumor (Figure 4). Histological studies revealed evidence of neoplastic cells, with a high nuclear-to-cytoplasmic ratio and aberrant nuclei and nucleoli, embedded within residual lymphoid tissue. Intra- and extra-cellular mucin was also identified.

The VN gross and histological appearance spurred further investigation in order to identify a

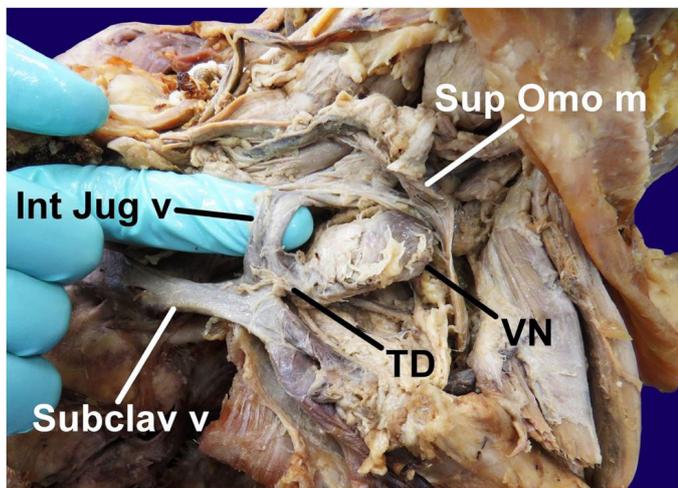


**Figure 1.** Dissection of the left-sided posterior cervical triangle revealed the presence of a Virchow node obscured entirely by the platysma and clavicular head of the sternocleidomastoid muscle and partly by the superior belly of the omohyoid muscle. **A** - Superficial dissection revealing the platysma muscle (**Plat**); **B** - The sternocleidomastoid muscle (**SCM**) underlying the reflected platysma.

primary tumor. The right and left lungs weighed 650 g and 690 g, and were 24.2 × 11.2 × 7.0 cm and 24.0 × 11.1 × 5.2 cm, respectively. The overlying pleura



**Figure 2.** Dissection of the left-sided posterior cervical triangle, after reflection of both the platysma and sternocleidomastoid muscles, revealed a Virchow node (VN) in the region of the lesser supraclavicular fossa.



**Figure 3.** Gross dissection of the left-sided lower anterior cervical region revealing a Virchow node (VN). The node was partially obscured at its superior pole by the superior belly of the omohyoid muscle (Sup Omo m) which has been retracted in this image. The node joined the thoracic duct (TD) which joined together with the internal jugular vein (Int Jug v) to contribute to the subclavian vein (Subclav v). The platysma and sternocleidomastoid muscles are reflected posteriorly and proximal half of the clavicle was resected to reveal the Virchow node and its surrounding vascular anatomy. The long axis of the VN was oriented parallel to the internal jugular vein and the distal thoracic duct.

was tan and smooth and showed scattered areas of environmental pigmentation. A 3.0 × 2.0 cm area of fibrinous exudate located in the hilar region of the left lung. Pleural puckering was not seen. The lungs were divided into lobes and serially sectioned from superior to inferior. The inferolateral right lower lobe contained a 4.6 × 5.0 × 2.1 cm area of dark-red indurated hemorrhagic consolidation. In the left lung, the hilum of the upper lobe had a 4.0 × 3.5 × 3.0 cm area of environmental pigmentation and necrotic pale rubbery lymph nodes ranging from 0.8 to 1.2 cm, with areas of white friable material. In the left lower lobe, a 4.2 × 4.0 × 3.5 cm white, indurated mass encased the adjacent vasculature and abutted the hilum (Figure 5). The uninvolved parenchyma was tan with widened alveolar spaces.

Comparison of the histopathology of the VN and the parahilar mass revealed marked similarities (Figure 6), indicative of a primary parahilar adenocarcinoma metastatic to the left supraclavicular VN.

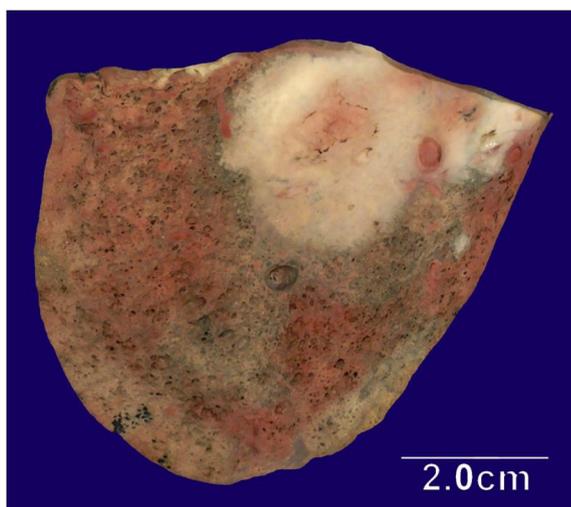
## CLINICAL DISCUSSION

The Troisier sign/Virchow node (VN) has profound clinical importance. Though reports have described the VN in many clinical settings, a paucity of reports have described cadaveric analysis including gross and histopathological analysis of both the primary tumor site and the VN.

Mizutani et al.<sup>32</sup> performed a study of the end node of the thoracic duct, which would be deemed a VN if enlarged due to metastasis. Their study identified the presence of the end node in 5 of 35 individuals (14%; two males and three females of a sample of



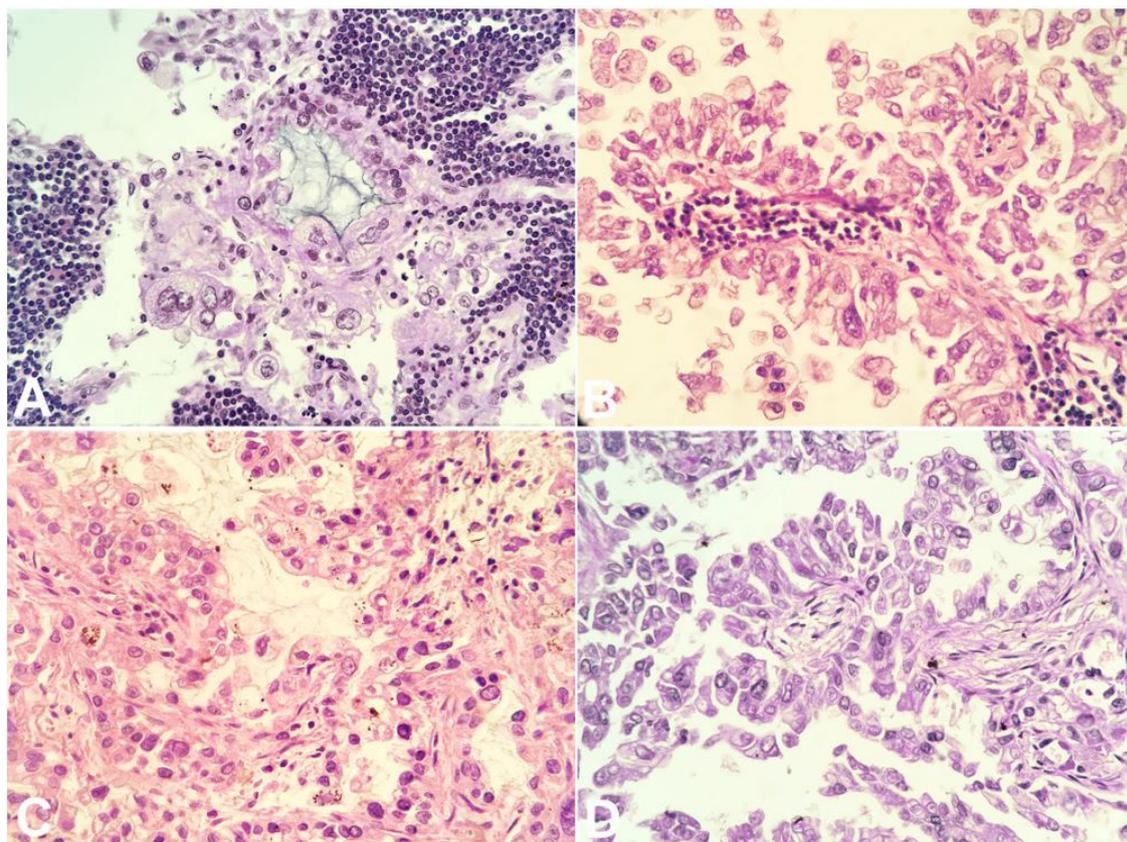
**Figure 4.** Serial sections of the Virchow node. The cut surfaces are almost entirely replaced by a grossly evident metastatic tumor.



**Figure 5.** Transverse section of the lower lobe of the left lung showing a 4.2 × 4.0 × 3.5 cm solid, pale, indurated mass that encases the adjacent vasculature and abuts the hilum. The uninvolved parenchyma is tan with dilated air spaces and many areas of environmental pigmentation.

15 males and 20 females). Of the five end nodes, two were tethered to the dorsal aspect of the carotid sheath and three were located anterior to the anterior scalene muscle. The VN in our case was anterior to the anterior scalene muscle, which is the normal location of the end node of the thoracic duct.<sup>32</sup> For reference, an *in vivo* clinical image of a VN of similar size (3.0 × 2.5 cm) and location to that reported in this study has been presented by Siosaki and Souza.<sup>33</sup>

The VN described in this case was in close proximity to several anatomical structures that warrant discussion. For example, the anterior scalene was located posterior to the VN. Therefore, enlargement of the VN may compress the anterior scalene muscle. Because the anterior scalene forms the anterior boundary of the scalene triangle, through which the brachial plexus of nerves and the subclavian artery pass, enlargement of the VN may cause left-sided



**Figure 6.** Side-by-side histopathological comparison between the Virchow node and lung masses (Hematoxylin and eosin stain at 400X magnification) **A & B** - Virchow node sections revealing neoplastic cells embedded within residual lymphoid tissue. The cells have a high nuclear to cytoplasmic ratio and display marked bizarre nuclei with prominent macronucleoli. The neoplastic cells form mixed morphology consisting of glandular (**A**) and papillary (**B**) architecture. Intracellular as well as extracellular mucin is readily identified; **C & D** - Histological sections of the lung mass with morphologic findings that correspond with the characteristics found within the Virchow node, consistent with metastasis from the lung tumor.

brachial plexopathy and decreased blood flow into the left upper extremity. Indeed, there have been several reports of brachial plexopathy as a result of compression by a tumor.<sup>34</sup> Therefore, the VN should be considered as a cause of thoracic outlet syndrome – both neurogenic thoracic outlet syndrome and vascular thoracic outlet syndrome. This finding is particularly important with regard to individuals with chronic obstructive pulmonary disease (COPD), similar to the individual described in this report, because the forced breathing in COPD may contribute to scalene muscle hypertrophy, a narrow interscalene passage, and subsequent insult to the neurovascular bundle.<sup>35</sup>

The left phrenic nerve was located between the VN and the anterior scalene muscle. Therefore, enlargement of the Virchow node could encroach upon the left phrenic nerve, potentially contributing to unilateral phrenic neuropathy. Unilateral phrenic neuropathy may be entirely asymptomatic. However, it may cause weakness, of varied severity, to its ipsilateral hemidiaphragm. It is, therefore, important to consider the aforementioned anatomical relationship in the context of the individual presented in this case, whose cause of death was listed as chronic obstructive pulmonary disease but was determined to have pulmonary adenocarcinoma and increased alveolar dead space. Indeed, the VN compressing the phrenic nerve may have contributed to dyspnea in this individual. Hypothetically, if the VN were to develop from a metastasis of a Pancoast tumor, the encroachment upon the brachial plexus, subclavian artery, phrenic nerve, and, additionally, the cervical sympathetic chain, could be exacerbated by both the Pancoast tumor and VN.<sup>36</sup> Indeed, the VN, even in the absence of a Pancoast tumor, has caused Horner syndrome.<sup>31</sup>

## CONCLUSION

Pulmonary adenocarcinoma, as well as several other forms of cancer, may metastasize through the thoracic duct and cause enlargement of a left supraclavicular lymph node. In addition to the importance of recognizing the enlargement of the lymph node as a sign of metastasis, it is important to regard the Virchow node (VN) as a potential source of neurovascular encroachment. As our report shows, the VN has the potential to contribute to varied

neuropathies of the brachial plexus and phrenic nerve as well as compression of the subclavian artery and vascular thoracic outlet syndrome due to its anatomical location. Therefore, the presence of a Troisier sign/VN should be assessed when thoracic outlet syndrome and phrenic neuropathy are suspected. Conversely, when a VN is identified, the possibility of concomitant or subsequent thoracic outlet syndrome and phrenic neuropathy should be considered.

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