Are the Two Heads of the Human Lateral Pterygoid Separate Muscles? A Perspective Based on Their Nerve Supply

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Based on biomechanic and electromyographic studies, it has been argued that the two heads of the human lateral pterygoid muscle (LPt) are reciprocally active during the masticatory cycle. Thus, it has been proposed that the heads be considered separate muscles. However, questions about the accuracy of these data have arisen. The authors hypothesized that partition cannot be complete without an independent nerve supply. To test this, complete unilateral lateral pterygoidectomies were performed on 20 dissection room cadavers. A novel approach, using an en bloc method, proved optimal to expose the detailed nerve supply to the LPt heads. In the two most frequently observed patterns (15 of the 20 specimens), the heads were supplied from a common source that was derived from either the long buccal or mandibular nerve, or from a loop that arose between the long buccal and lingual nerves. In a third pattern, independent branches to either head arose from the deep temporal, long buccal, or mandibular nerve. In only 20% of the specimens did the two heads receive exclusive innervation from separate sources. The most significant finding of the present study is that both LPt heads in humans are usually supplied by a common proximate source, but each head also receives independent nerves in every case. In the absence of precise information about the functional components in each nerve branch, these data appear to support Juniper's proposal to regard the two LPt heads as entirely separate muscles.
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Typically the human lateral pterygoid muscle (LPt) has two distinct heads of origin separated by a fascial plane that conducts the long buccal nerve.[1–5] Although there is agreement regarding the separation of the two heads at their origins, the degree of separation at their insertion is in dispute. Generally, the inferior head (ILPt) inserts on the pterygoid fovea, while the superior head (SLPt) is reported to be variably attached to the disc (meniscus), condyle, fovea, and/or the capsule of the temporomandibular joint (TMJ).[5–26]

Based on phylogenetic,[7,8] anatomic,[5] biomechanic,[27–29] and electromyographic (EMG)[30,32–35] evidence, it has been suggested that the two LPt heads be regarded as separate muscles. In fact, it has been recommended that the SLPt be designated the "sphenomeniscus,"[7,8] "protrudens menisci,"[5] or "superior pterygoid"[31] muscle. Juniper[31] has proposed that the designation "lateral pterygoid" be retained for the ILPt only. Numerous biomechanic and physiologic (EMG) studies suggest that the two LPt heads are reciprocally active during the masticatory cycle.[30,32–35] However, because of their incomplete separation, variable insertion, deep location in the masticator space, and interdigitation with fibers of the temporalis and medial pterygoid muscles, they can be differentiated only with considerable difficulty. Since the LPt is often completely covered by the temporalis laterally and by the medial pterygoid medially, the precise placement of recording electrodes in the LPt heads is problematic. Therefore, at least some of the functional data is equivocal.[15,25,36,37]

Because of the intimate topographic relationships of the LPt heads to the TMJ and adjacent nerves and blood vessels, the muscle has been implicated in temporomandibular disorders.[23–26,31] It has been claimed that spasms of or trauma to the SLPt alone are involved in the anterior dislocation of the disc,[6,27,28,31] but several recent studies argue against this view.[16,29,30,32]

Each of the arguments to regard the two LPt heads as separately operating muscles would be strengthened if it could be shown that the LPt heads receive independent innervation from the mandibular nerve. Despite cursory observations on the nerve supply to the human LPt[2,38–41] there have been no studies specifically targeted to show the precise origins and distribution of the nerves that innervate the LPt heads.

The objective of the present study was to test the hypothesis that separate muscles with independent functions are supplied by separate nerves. If the two heads of the LPt act as separate muscles in any part of the chewing cycle, then they must be supplied independently. A delineation of the actual course and distribution of the nerves that supply the two heads also has potential implications for the differential diagnosis and treatment of TMJ dysfunction. Because some variability in the innervation of the LPt is to be expected, the authors also aimed to document the extent of the variability. Preliminary reports of this work have been previously presented.[42,43]

Materials and Methods

Unilateral lateral pterygoidectomies were performed on 20 dissection room cadavers; the opposite sides of the cadavers had been used by medical and dental students for a deep dissection of the masticator space in accordance with the technique of Sauerland.[44] The sources of the LPt specimens are detailed in Table 1.

Several approaches were tested in an effort to completely expose the LPt nerve branches: *(1)* mobilization of the two heads at their origins with lateral reflection[42]; *(2)* freeing the joint capsule to reflect the heads laterally near their insertions at or close to the disc-condyle assembly[42]; *(3)* careful removal of the floor of the middle cranial fossa by osteotomy to expose the proximal branches of the mandibular nerve from its superior aspect; and *(4)* excision of a tissue block that contained the intact lateral pterygoid with the entire mandibular nerve inferior to the trigeminal ganglion, the disc-condyle assembly, and the associated blood vessels. The first and second approaches proved unsatisfactory for the present purposes because when the muscle heads or the condyle were reflected laterally, most of the small and delicate LPt nerves were unavoidably detached from either their sources or their targets. Although promising, the third approach was laborious and time consuming, and it did not always yield an unobstructed view. The en bloc lateral pterygoidectomy provided the most accurate record; this approach is described here in some detail because, to the authors' knowledge, it has never been reported. The protocol was as follows.

Table 1 Specimen Profile

Specimen	Race	Gender	Side	Estimated age (y)
HU 121	C	F	Right	50–60
HU 122	C	F	Left	50–60
HU 123	Mi	M	Right	60–70
HU 126	C	F	Left	50–60
HU 127	A-A	M	Left	50–60
HU 129	C	M	Left	50–60
HU 130	A-A	M	Right	60–70
HU 131	C	M	Right	50–60
HU 131D	A-A	M	Right	50–60
HU 132	A-A	M	Left	50–60
HU 133	C	M	Right	50–60
HU 134	C	M	Left	50–60
HU 139	C	M	Left	50–60
HU 140	A-A	F	Left	50–60
HU 141	C	M	Right	50–60
HU 143	C	F	Left	50–60
HU 144	A-A	M	Left	60–70
HU 146	C	F	Right	60–70
HU 148	C	M	Left	50–60
HU 155	C	F	Left	50–60

A-A = African-American; C = Caucasian; Mi = Mixed.

The superficial structures (eg, the parotid gland and duct, the masseter muscle, etc) were removed. The maxillary artery and the distal portions of the masseteric and long buccal nerves were carefully identified and retained in situ throughout the procedure to establish topographic relationships.

The zygomatic arch was entirely removed by osteotomy. The buccal fat pad over the buccinator muscle and its extension into the infratemporal

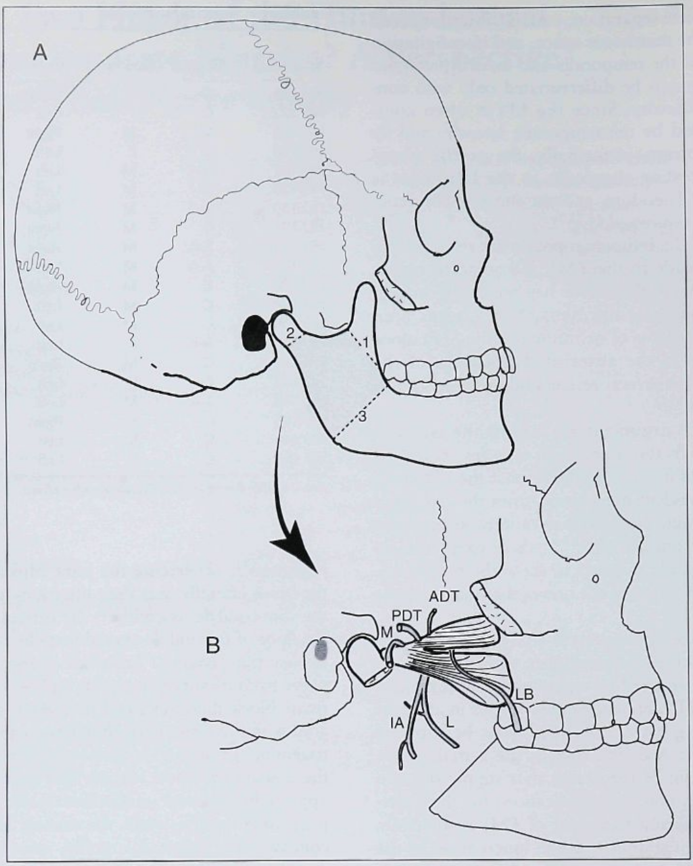


Fig 1 Procedure for removal of intact tissue block from deep masticator space. (A) Three planes for osteotomy of the mandibular ramus that are required to expose the lateral pterygoid muscle. (B) Lateral view of LPt tissue block disc-condyle assembly with its nerve branches. ADT = anterior deep temporal nerve; IA = inferior alveolar nerve; L = lingual nerve; LB = long buccal nerve; M = masseteric nerve; PDT = posterior deep temporal nerve.

fossa were removed. Osteotomy of the mandibular ramus was performed along the three planes indicated in Fig 1. The coronoid process and the insertion of the temporalis were mobilized by means of a cut that was made along line 1. Section 2 was made approximately 1.75 cm inferior to the mandibular condyle to preserve the LPt insertion on the fovea, while cut 3 completely excised the mandibular ramus from its body to sever the inferior alveolar nerve and vessels. The portion of the ramus between these cuts was eased out to expose the masticator space.

The exposed connective tissue was carefully cleaned to delineate the lingual, inferior alveolar, and mylohyoid nerves and their associated vessels. The coronoid process and temporalis tendon were reflected superiorly after the long buccal nerve was freed from its passage through the temporalis tendon. The nerve was followed medially to the connective tissue gap between the LPt heads, but no further.

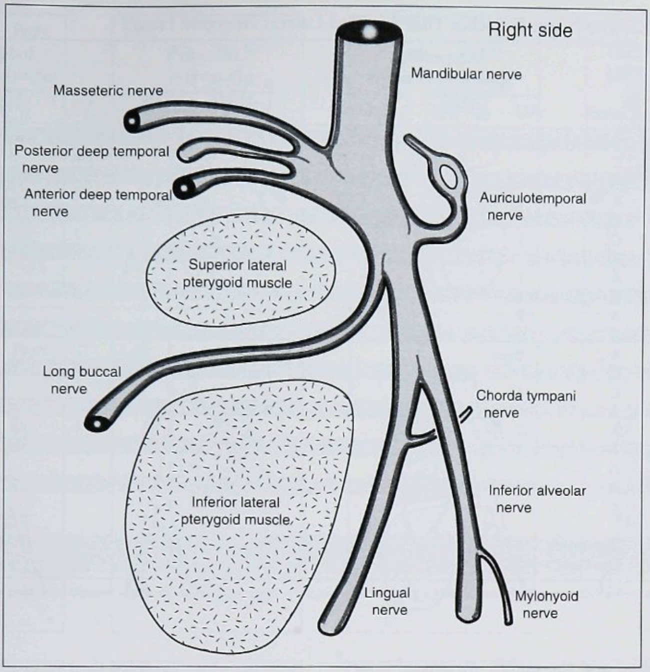


Fig 2 Template used to record precise distribution of mandibular nerve branches to the two LPt heads. In this and all similar figures the structures are shown in a modified frontal view: the specimen faces the observer.

The lateral surfaces of the LPt and the medial pterygoid were cleaned of the pterygoid venous plexus and fascia, and all of the branches of the maxillary artery and mandibular nerve were identified. The portion of the maxillary artery that covered the LPt and the sphenomandibular head of the temporalis was removed to completely expose the lateral surface of the LPt. A sharp-ended probe was inserted between the periostium that covered the bony surfaces of the infratemporal crest, the greater wing of the sphenoid, and the SLPt. This muscle was cleanly elevated from its origins, which allowed all of the nerves and vessels related to the superior surface (masseteric and deep temporal nerves) to remain attached.

The lateral temporomandibular ligament and the capsule were incised horizontally to open the TMJ. A probe was inserted between the disc and the mandibular fossa and the disc-condyle assembly was pushed inferiorly, which caused the anterior, posterior, and medial parts of the TMJ capsule to become taut and exposed. They were then cut horizontally to partially free the disc-condyle assembly from its association with the mandibular fossa.

Under a dissecting microscope, the areas medial to the lingual and inferior alveolar nerves were carefully cleaned to mobilize each nerve from the mandibular nerve to its origin. This procedure allowed careful exploration within the fascial plane between the LPt and medial pterygoid without fear of disruption to the small nerves that supply these muscles.

The origins of the ILPt were freed from the lateral pterygoid plate and maxilla with a sharp scalpel. A blunt probe was carefully reinserted between the infratemporal surface of the sphenoid and the SLPt to ease the entire block of tissue down and expose the trunk of the mandibular nerve (anteriorly) and the middle meningeal artery (posteriorly). The

Table 2 Overview of Nerve Branches That Supplied Lateral Pterygoid Heads

		Independent superior LPt nerves			Common LPt nerves		Independent inferior LPt nerves		
Specimen	Pattern	V3	LBN	Other	V3	LBN	V3	LBN	Other
HU 121	A-B		1			1 loop			2 loop
HU 122	C			1 DT			2		
HU 123	A			2 DT		1		2	
HU 126	A		1	1 DT	1		2		
HU 127	A	1			1		1	1	
HU 129	C	1					1	1	
HU 130	A			1?		1		1	
HU 131	A	1				1		2	
HU 131D	B	1	1					1	2 loop
HU 132	A	2		1 DT		1		1	
HU 133	A		1	2 DT		1		1	1 Lng
HU 134	A	1				1	2		
HU 139	C		1				2	2	
HU 140	C	1	1					1	
HU 141	A	1	1			1		2	
HU 143	A	2	2			1	1		
HU 144	A	1	1			1		1	
HU 146	A		1			1			
HU 148	A	1				1	2		
HU 155	A				1	1			
Total	Specimens	11	10	6	3	13	8	12	3
	Branches	13	11	8	3	13	13	16	5

LPt = lateral pterygoid nerve; V3 = mandibular nerve; LBN = long buccal nerve; DT = deep temporal nerve; Lng = lingual nerve; loop = ansa.

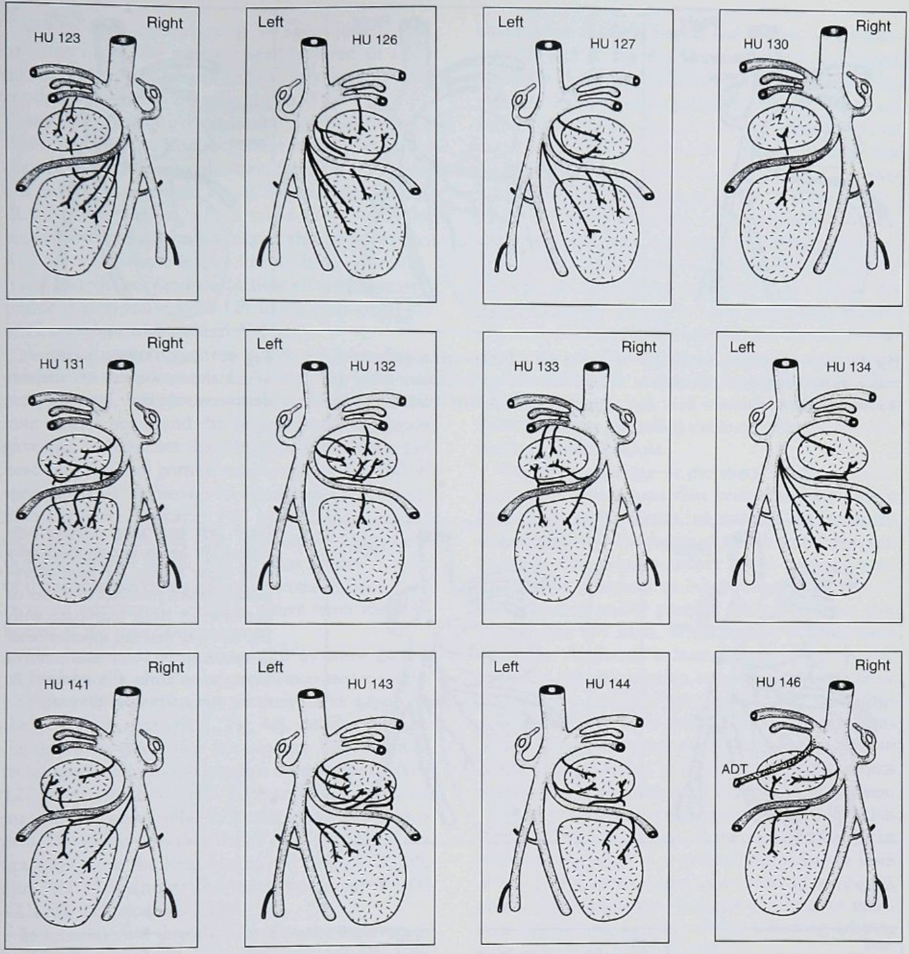
mandibular nerve and the middle meningeal artery were cut as close to their respective foramina as possible. The intact block was lifted out of the masticator space. The block included the LPt, the TMJ disc-condyle assembly, the mandibular nerve with its truncated major branches, and the attached blood vessels. The outline of the tissue block that was removed is shown in Fig 1.

The tissue block was identified, dated, and washed thoroughly. A dissecting microscope was used to further clean the fascia and expose the nerves. The long buccal nerve was cleaned carefully in the cleft between the two LPt heads to expose the branches that were frequently found to arise from it. To locate most other nerve branches, it was necessary to carefully clean the connective tissue between the mandibular nerve and the LPt heads. By dissection of the superior aspect of the tissue block the twigs that supply the SLPt from the deep temporal or masseteric nerve were exposed.

To record the observations of each specimen, the precise distribution of mandibular nerve branches and their topographic relations to each LPt head were drawn on a standardized coronal view as depicted in Fig 2. Photographic records of each specimen at critical junctures were kept, in addition to notes made throughout each dissection. The number of nerves from their respective origins to the two LPt heads was counted; this numeric data is presented in Table 2.

Results

Individual records of our observations were grouped in similar patterns of nerve distribution and are shown in Table 2 and Figs 3 to 6. In the most prevalent pattern, each LPt head received a branch from a common source that originated either from the long buccal or mandibular nerve (Fig 3). This pattern was designated as the common lateral pterygoid nerve, and it was observed in 15 of 20 specimens (75%). This configuration is shown as pattern A in Fig 4a. In 12 of these 15 cases, the common nerve originated directly from the long buccal nerve in the cleft between the two heads. In two more of these 15 cases, the common nerve arose independently from the inferior division of the mandibular nerve. One of the specimens (HU 155) that was included in the first group of 12 also showed a common nerve that arose from the inferior division of the mandibular nerve (Fig 3). In another case, which is described below as pattern B, a common LPt nerve was also found in a specimen with a nerve loop.



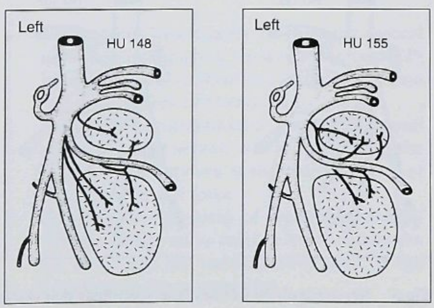


Fig 3 Nerve supply to the LPt heads in individual specimens. Note that each specimen displays a common LPt nerve that arises from the long buccal nerve (for examples see Figs 5 and 9).

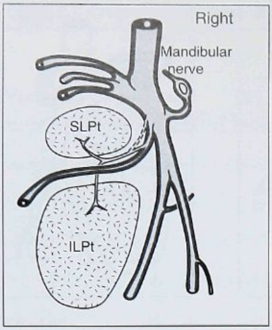


Fig 4a Innervation pattern A, which shows common LPt nerve sources to both heads.

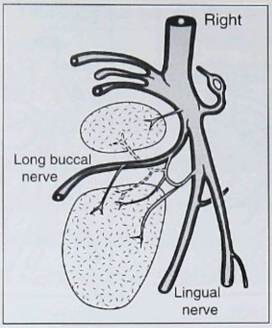


Fig 4b Innervation pattern B, which shows branches from an ansa, or loop, that includes a common LPt nerve.

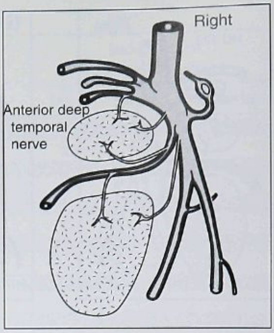


Fig 4c Innervation pattern C, which shows sources of independent nerve supplies.

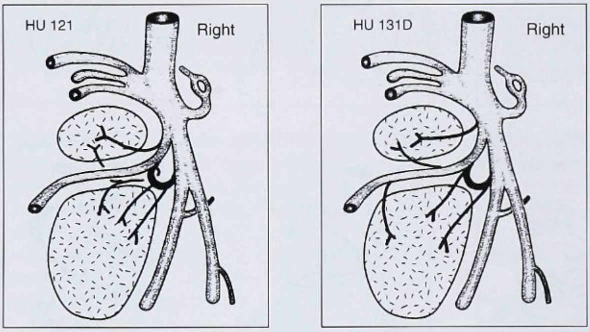


Fig 5 *(left and right)* Nerve supply to LPt heads in two specimens that show a loop, or ansa pterygoidea, which provides branches to the inferior head (compare with Fig 9). Note that the superior head in specimen HU 121 also receives innervation from a common LPt nerve that arises from the ansa.

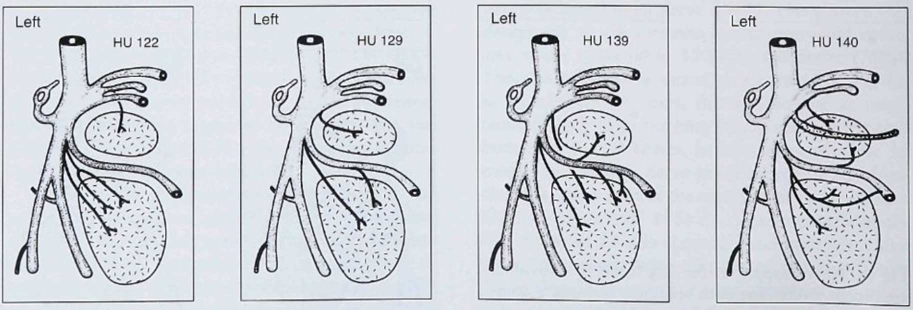


Fig 6 Nerve supply to LPt heads in specimens that display variable sources of distribution (see Fig 10 for example).

Within the main group of 14 specimens with a common nerve, the superior head received an additional independent branch or branches directly from another source in 12 tissue blocks (Figs 3 and 7). This additional superior lateral pterygoid nerve (SLPtN) originated from either the mandibular, long buccal, or deep temporal nerve. Similarly, the inferior head was supplied by an independent branch (ILPtN) or branches, which arose either from the mandibular or long buccal nerve; this phenomenon was also encountered in 12 of these 15 cases. Independent nerves in addition to the common source that supplied both LPt heads were observed in 12 instances with pattern A (Fig 8).

A second pattern, pattern B (Fig 4b), was distinguished by the presence of a nerve loop (the ansa pterygoidea), which communicated between the long buccal nerve and the lingual nerve. It always gave rise to branches that supplied the inferior LPt head (Fig 5). This pattern was found in 2 of the 20 specimens (10%). Similar to those cases with a common LPt nerve, specimen HU 121 displayed a common branch from the loop that supplied the superior and inferior heads (Fig 9). Also similar to most of the specimens that exhibited pattern A, each head received additional branches either from the long buccal or the mandibular nerve.

The remaining four cases (20%) were distinguished by the absence of a common nerve source and the relative exclusivity of their nerve supply to the LPt heads (pattern C, Fig 4c). As illustrated in Fig 6, within this group the superior head received its innervation from the anterior deep temporal (HU 122), long buccal (HU 139 and HU 140), or mandibular nerve (HU 129 and HU 140) (Figs 6 and 10). The inferior head was supplied by branches from the long buccal (HU 129, HU 139, and HU 140) and/or the mandibular nerve (HU 122, HU 129, and HU 139).

In a finding not directly related to the innervation of the LPt, 2 of the 20 cases (HU 140 and HU 146) showed that the anterior deep temporal nerve coursed through the substance of the superior LPt head but did not supply it (Figs 3 and 5).

Discussion

The above observations lead to several important implications about the nerve supply to the two LPt heads. In an overwhelming number of cases (15 of 20), the two heads were supplied from a common LPt nerve that was derived from the long buccal or mandibular nerve, or from the ansa pterygoidea that bridges the long buccal and lingual nerves (patterns A and B, Fig 4). Thus, our most significant finding is that both LPt heads in humans are usually supplied by a common proximate source. Based on our hypothesis of the necessity of separate nerve supplies to support independent muscle actions, this finding could lead to the conclusion that the two LPt heads should function as a single unit. However, this conclusion is unwarranted because each head receives a separate branch from the common source. Additional independent branches to each head were almost universally seen (17 of 20 cases) to arise from sources such as the deep temporal, long buccal, and/or mandibular nerves. These data seem to support Juniper's[31] proposal to regard the two LPt heads as entirely separate muscles. The anatomic, functional, and clinical implications of these findings, including contrary viewpoints, are further explored below.

Without knowledge of the exact functional components of the axons that comprise each nerve branch (sensory, motor, or mixed), no categoric determination of the degree of muscle separation can be made. The ultimate answer lies in neuronal tracing studies designed to label the populations of motorneurons and/or primary afferent neurons that supply each LPt head. While studies of this nature cannot be conducted in humans, it may be possible to obtain this information in nonhuman primate or suid models. Juniper's[31] proposal will be unequivocally upheld only if it is found that the motorneurons or primary afferents that supply each head belong to different populations within the trigeminal motor nucleus and/or the mesencephalic trigeminal nucleus.

Given the intimate relationship of the LPt heads to the proximal portion of the mandibular nerve (SLPt in particular), it is evident that if one or both of the heads were injured as a result of iatrogenic events, traumatic force, vascular accident, or infectious agents, one or more of the following adverse outcomes could occur (Fig 11):

1. Entrapment neuropathy of the long buccal nerve, which passes between the two LPt heads or medial to them and includes common and independent LPt branches
2. Entrapment neuropathies of the deep temporal and masseteric nerves, which pass within the SLPt head or between it and the bony roof of the infratemporal fossa
3. Entrapment neuropathy of the inferior root of the mandibular nerve itself as it passes between the SLPt and the cartilaginous wall of the nasopharynx (torus tubarius)

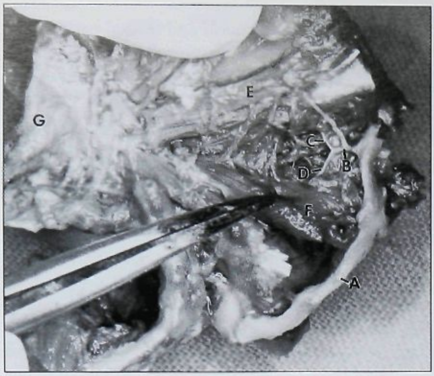


Fig 7 Lateral view of tissue block HU 132 that shows the common LPt nerve (B) that arises from the long buccal nerve (A) and supplies both heads. Inferior LPt head (F) is retracted with forceps (compare with Fig 3). C = superior LPt nerve; D = branch to inferior head; E = superior LPt head; G = disc-condyle assembly.

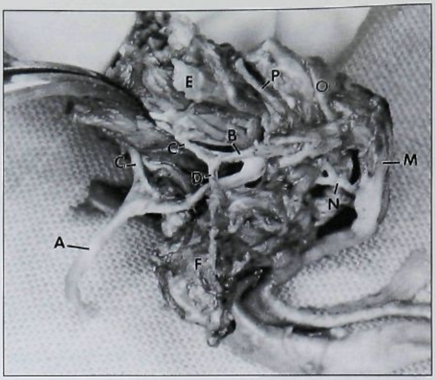


Fig 8 Medial aspect of tissue block HU 141 that shows the common LPt nerve (B) and an independent branch to the inferior LPt head (N) that arises from the mandibular nerve (M). It should be emphasized that the divisions of the mandibular nerve intimately conform to the contours of the sphenoid and the cartilaginous wall of the nasopharynx (compare with Fig 3). A = long buccal nerve; C = superior LPt nerve; D = branch to inferior head; E = superior LPt head; F = inferior LPt head; O = nerve to masseter; P = posterior deep temporal nerve.

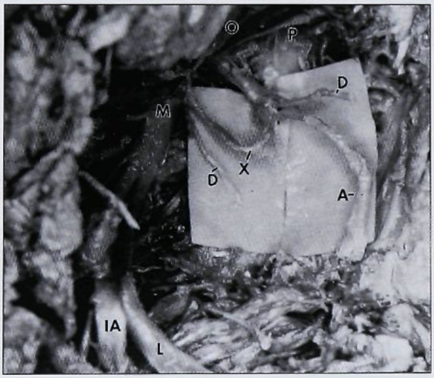


Fig 9 Right lateral view of the nerve loop (X), which supplies the inferior LPt head in tissue block HU 131D. The entire LPt muscle was removed from around the loop to expose the mandibular nerve at its entrance to the infratemporal fossa via the foramen ovale (compare with Fig 5). A = long buccal nerve; D = branch to inferior head; IA = inferior alveolar nerve; L = lingual nerve; M = mandibular nerve; O = nerve to massester; P = posterior deep temporal nerve.

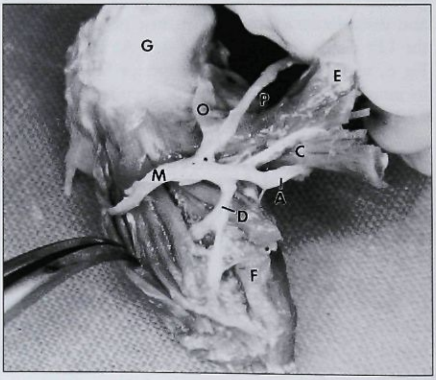


Fig 10 Superomedial aspect of tissue block HU 129 that shows independent branches (C and D) to both LPt heads in the absence of a common LPt nerve. Here, it can be appreciated that all branches that pass superior to the SLPt are in direct contact with the infratemporal surface of the sphenoid. The mandibular nerve (M) was truncated (compare with Fig 6). A = long buccal nerve; E = superior LPt head; F = inferior LPt head; G = disc-condyle assembly; O = nerve to masseter; P = posterior deep temporal nerve.

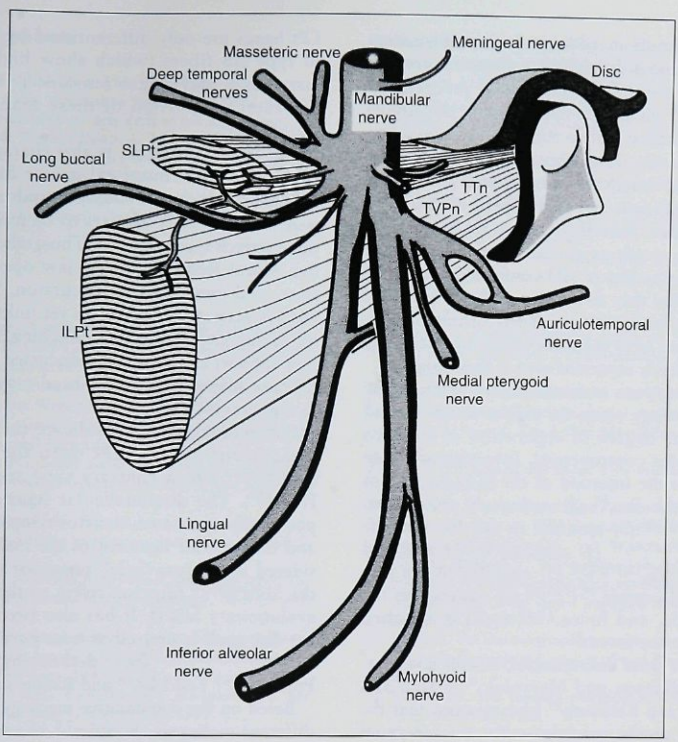


Fig 11 Mandibular nerve and its distribution. Anteromedial view emphasizes the close and intimate topography of the region with its numerous sites of possible nerve injury and entrapment. Note that neither the bony and cartilaginous superior and medial walls of the infratemporal fossa nor the vascular network are shown so that the complex neural distribution may be appreciated. TTn = tensor tympani nerve; TVPn = tensor veli palatini nerve.

Such conditions might easily result in the various sites of pain and paresis associated with temporomandibular disorders. Once begun, these specific conditions within the rigid and confined masticator space could affect (and be aggravated by) orofacial behaviors other than mastication. Figure 11 provides a summary perspective of the topographic relations of the mandibular nerve to the LPt heads.

Since there was no independent source to a given LPt head in addition to the common LPt nerve in only three cases, one wonders why the heads were supplied from diverse origins. From an evolutionary perspective, nerves that arise from a source other than a common one would ensure the continued function essential for the survival of the organism. Since the LPt is involved in so many critical behaviors (opening, closing, and translation of the mandible during the masticatory cycle; protrusion during incisive biting; and derived functions such as panting, yawning, vomiting, vocalization, and facial signaling), it appears reasonable that natural selection would favor the observed adaptation for several independent sources of innervation for each head. This organization is insurance against noniatrogenic injury and impaired function.

The implications of our results must also be viewed in relation to additional anatomic and functional criteria for the separation of the LPt heads. To be considered independent, a muscle should show several traits in addition to an independent nerve supply and a definable set of central nervous system reflex controllers. Thus, each independent muscle "belly" should: *(1)* have a clearly discernible origin and insertion and be enclosed in its own fascial compartment; *(2)* display a consistent myoarchitecture and muscle fiber type; and *(3)* exhibit definable ontogenetic and phylogenetic origins.

There has been general consensus for many years that the LPt muscle originates from two distinct heads. Recently, Abe et al[19] confirmed this in 79 human samples; they found that 70% of LPt muscles originate from two completely distinct bellies. However, there were instances where the two heads were incompletely separated even at their origins.

Despite numerous macroscopic and microscopic studies over many years, the precise insertion, and therefore the degree of separation of the two heads, remains controversial. Investigators have reported that the insertion of the SLPt is: *(1)* not attached to the disc,[45] *(2)* exclusively attached to the disc,[6,10–12,46] *(3)* attached to the disc and the condyle,[9,21,22,29,46,47] *(4)* attached to the disc and pterygoid fovea,[15,27,39,48] *(5)* attached to the disc and the TMJ capsule,[10,11,21,49] *(6)* attached to the disc, condyle, and fovea,[13,17] and *(7)* attached exclusively to the fovea.[32]

To address these discrepancies, careful investigations by Wilkinson and Maryniuk,[13] Flatau and Klineberg,[39] and Klineberg[50] have revealed that the SLPt inserts on the condyle and/or the pterygoid fovea but that a connective tissue bridge anchors the "sole of the foot" of the disc to the SLPt. Bittar et al[51] concur with this view, but also observed that the two heads inserted into the fovea by different mechanisms when examined histologically. Thus, it appears that the differences in the detailed manner of connective tissue attachment of the LPt heads leads to the observed differences in the action of the muscles and movements of the disc-condyle assembly.

With reference to their myoarchitecture, Schumacher[9] and Widmalm et al[15] have stated that the fibers of the SLPt exhibit a parallel configuration, while the ILPt displays a pennate arrangement. Schumacher[9] also found that the SLPt and the ILPt are rotated medially 37 degrees and 33 degrees, respectively, from the parasagittal plane; they lie 20 degrees above and 20 degrees below the occlusal plane, respectively. Schumacher thus concluded that the vector of the pull of the two heads "probably will be different" (see also McDevitt[3] and Aziz and Cowie[42,43]).

Based on histochemical fiber analysis, Eriksson and coworkers[52,53] have recorded that the two LPt heads are only differentiated by the presence of type IIB fibers (which show high threshold, fast twitch, and fatigue resistance). The SLPt has a greater proportion of these than its inferior counterpart.

The lateral pterygoid is also characterized by a low incidence of intrafusal muscle fibers (afferent spindles), which are chiefly found in its inferior part.[54–56] The SLPt appears to be mostly bereft of these stretch receptors.[55–57] Thus, whereas the ILPt has neural feedback during jaw opening, protrusion, and contralateral excursion, the superior head is activated by some as yet unknown modality during jaw closing and clenching.[50] These findings support the previously discussed idea that the primary afferents to either head may be different in topography and/or type.

Embryologic studies indicate the early direct attachment of the SLPt onto the developing disc[26,58–69] (for a contrary view see Baume and Holtz[70]). The discomalleolar ligament (with its potentially associated "laxator tympani" muscle[71]) and the anterior ligament of the malleus are considered to be "atavistic" posterior extensions of the SLPt[60,62,70] (atavism refers to the retention of evolutionary relics). It has also been argued that the disc itself is derived at least partially from the SLPt[60,61,66,68,72] (for dissenting views see Furstman,[63] Youdelis,[64] and Baume and Holtz[70]).

Based on the comparative myology of the LPt in different mammals, Prentiss[7,8] has suggested that the two heads probably originated at different times and have evolved at different rates. He regarded the SLPt as homologous to the sphenomeniscus muscle of ancestral mammals. The common innervation is likely to be a derived characteristic in primates. The fact that in 20% of the present cases the two heads were exclusively supplied by their own nerve may bolster Prentiss'[7,8] contention.

This work summarized the differences between the two LPt heads with reference to their attachments and fascial enclosure, myoarchitecture and histochemistry, and ontogenetic and phylogenetic criteria. The present data also appear to argue for the partition of the lateral pterygoid muscle. However, a careful examination of these data shows that they are limited and as yet preliminary. It is necessary to collect and more critically evaluate information in all of the above categories with larger sample sizes before formally splitting the muscle. As indicated previously, if neural mapping were to show the unequivocal segregation of centrally located neurons, the partition of the muscle should be sanctioned.

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Resumen

¿Son las Dos Porciones del Pterigoideo Lateral en el Humano Músculos Separados? Estudio Perspectivo Basado en su Suministro Nervioso

Estudios biomecánicos y electromiográficos han generado discusiones sobre si las dos porciones superiores del músculo pterigoideo lateral en el humano, son activas recíprocamente durante el ciclo masticatorio. Por lo tanto, se ha propuesto que estas porciones superiores sean consideradas músculos separados. Sin embargo, han surgido preguntas acerca de la exactidud de esta información. Los autores han presentado hipótesis acerca de que esta partición no puede ser completa sin un suministro nervioso independiente. En este estudio se realizaron pterigoidectomías unilaterales completas en 20 cadáveres de disección, para probar esta teoría. Se utilizó un acceso original, con un método en bloque, el cual resultó ser óptimo para exponer el suministro nervioso detallado de las porciones del pterigoideo lateral. En los dos patrones observados mas frecuentemente (15 de los 20 especímenes), las porciones fueron suministradas por una fuente común que fue derivada ya sea del nervio largo bucal o del mandibular, o por un asa que se origina entre los nervios largo bucal y lingual. En un tercer patrón observado, las ramas independientes a cualquiera de las dos porciones se originaron del nervio temporal profundo, del largo bucal, o del mandibular. En solo el 20% de los especímenes las dos porciones recibieron inervación exclusiva de fuentes separadas. El hallazgo más significativo de este estudio es el que ambas porciones del músculo pterigiodeo lateral en humanos son enervadas por una fuente próxima común, pero cada porción también recibe nervios independientes en cada caso. Debido a la ausencia de una información precisa acerca de los componentes funcionales en cada rama nerviosa, esta información parece soportar la propuesta de Juniper que dice que las dos porciones de los músculos se deben considerar como músculos completamente separados.

Zusammenfassung

Sind die Beiden Spitzen des Menschlichen Quer-Pterygoid Separate Muskeln? Eine Perspective die auf Ihrer Nervelichen Ausstattung Basiert

Auf dem Grund der biomechanische und electromyographische Studien, ein abwechselnd Wirkung der zwei Teilen der Muskel pterygoideus lateralis (LPt) des Menschen durch die Kauzyklus war vorgeschlagt. Also, die beide Teilen könnte Mann wie isolierte Muskeln ansehen. Die Genauigkeit dieser Ansicht jedoch stellt in Frage. Unser Hypothese ist das die zwei Teilen dieser Muskel, ob sie wirklich zwei Muskeln darstellen, müssen selbständige Innervationen haben. Zu diese Frage probieren, wir haben die LPt unilateral und vollständig in 20 Leichnamen geabschneiden. Diese neue en bloc Methode gab uns die beste Ausstellung der Innervation der beide Teilen der LPt. Die häufigste Bemerkungen über die Innervation in 15 von 20 Leichnamen zeigten das die beide Teilen der LPt Nerven von einer gemeinen Quelle bekommpten: entweder von der langen Backennerven oder von der Kinnbackennerven. In einer dritte Verteilung der Nerven, selbständige Zweige zu den beiden Teilen aus der langen Backennerven oder der Kinnbackennerven entsprangen. In nur 20% der Fälle, die zwei Teile Innervation aus isolierten Quellen bekommpten. Nach unsere wichtigste Ergebnisse, die zwei Teile der LPt des Menschens Nerven meistens aus einer gemeiner Quelle und auch aus selbständige Nerven bekommen. In die Abwesenheit der Informationen über die Funktion jeder Nervenzweige, unsere Data können die Ansicht Junipers das der Teilen der LPt sind zwei ganz isolierte Musklen bestätigen.