wjpmr, 2025, 11(6), 431-438

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH
www.wjpmr.com

SJIF Impact Factor: 6.842

Review Article
ISSN (O): 2455-3301
ISSN (P): 3051-2557

A COMPREHENSIVE REVIEW OF PESHI SHARIR VIS-À-VIS MYOLOGY W.S.R. TO CONFIGURATIONAL ATTRIBUTE

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Article Received on 21/04/2025 **Article Revised on 11/05/2025** **Article Accepted on 01/06/2025**

ABSTRACT
Human body is organizational statute of seven dhatus. All the seven dhatus are distinct and possess their individual regime of requisite rationale. They remain in dynamic equilibrium with each other physiologically as well as anatomically. Third dhatu is named as mans dhatu. It is formed by second dhatu i.e. rakta dhatu. As per acharya sushruta vayu along with pitta initiates metabolism of related srotas of mans dhatu, resulting into the formation of Peshi. Other acharyas have put forth the concept of genesis of Peshi as Agni metabolise rakta dhatu and after active involvement of vayu; result is peshi. moreover its function is lepan, means cover of all vital anatomical structures viz. vessels, bones, joints, visceras and etc. they are the motors of human body. Muscle tissue is one of the basic tissues that are specialized to shorten in length by contraction causing movement. It is in this way that virtually all movements within the body, or of the body in relation to the environment, are ultimately produced. Most muscles arise from the mesoderm. Skeletal muscles are derived from paraxial mesoderm, including somites, give rise to muscles of the axial skeleton, body wall, and limbs, and somitomeres, give rise to muscles of the head. Progenitor cells for muscle tissues are derived from the ventrolateral (VLL) and dorsomedial (DML) edges (lips) of the prospective dermomyotome. Cells from both regions contribute to formation of the myotome. Abaxial muscle precursor cells differentiate into infrahyoid, abdominal wall (rectus abdominis, external and internal obliques, transversus abdominis), and limb muscles. Primaxial muscle precursor cells form muscles of the back, some muscles of the shoulder girdle, and intercostal muscles. Molecular signals for muscle cell induction arise from tissues adjacent to prospective muscle cells. Thus, signals from lateral plate mesoderm (BMPs) and overlying ectoderm (WNTs) induce VLL cells, whereas signals from the neural tube and notochord (SHH and WNTs) induce DML cells. Connective tissue derived from somites, parietal mesoderm, and neural crest (head region) provides a template for establishment of muscle patterns. Most smooth muscles and cardiac muscle fibers are derived from Visceral mesoderm. Smooth muscles of the pupil, mammary gland, and sweat glands differentiate from ectoderm. All the above considerations of modern embryology is dealt in ayurveda in terms of agni, vayu, srotas, daran, pakvata, vibhajan and etc.

KEYWORDS: Peshi, skeletal muscle, smooth muscle, cardiac muscle, actin, myosin, sarcomere, dark band, light band.

INTRODUCTION (REVIEW)

Etymology

पेशी शब्द पिशित शब्द से निष्पन्न है ।

- पिशित अर्थात् अविभक्त मांस
- पेशी (muscle) अर्थात् विभक्त मांस (मांस खण्ड)
- मांसावयवसङ्घातः परस्पर वेभक्तः 'पेशी' इत्युच्यते ।

निबन्धसङ्ग्रह व्याख्या (डल्हण कृत),

सु.शा.5/37

उत्पत्ति :

यथार्थमूष्मणा युक्तो वायुः स्रोतांसि दारयेत् ।
(वायुः) अनुप्रविश्य पिशितै पेशीर्विभजते तथा ॥ सु.शा. 4/28
गर्भव्याकरणशारीरम्

व्याख्या एवं स्वरुप

वायुः पिशितं मांसमनुप्रविश्य पेशीर्विभजते, पेशी मांस खण्डः [३] | ३. 'मांसखण्डम्' इति पा.

निबन्धसङ्ग्रह व्याख्या (डल्हण कृत) I सु.शा. 4/26-30
(गर्भव्याकरणशारीरम्)

पेशी एवं गर्भज भाव संबंध

मांस-शोणित-मेदो-मज्ज-हनाभित्वलीहान्त्र-गुद प्रभृतीनि मृदूनि मातृजानि |

सु.शा. 3/31 (गर्भावक्रान्तिशारीरम्)

पेशी एवं स्रोतस संबंध

मांसवहे द्वे, तयोर्मूलं स्नायुत्वचं रक्तवहाश्च धमन्यः, तत्र विद्धस्य श्वयथुर्मोसशोषः सिराग्रन्थयो मरणं च;

सु.शा. 9/12(ऊ) धमनीव्याकरणशारीरम्
मांसवहानां च स्रोतसां स्नायुर्मूलं त्वक् च।

च.वि. 5/7-8 स्रोतोविमानम्

पेशी संख्या
पञ्च पेशीशतानि भवन्ति । पुरुषः 500, स्त्रियों में: 520 (सुश्रुत) ; चरक: 400
षडंगानुसार पेशी संख्याः

तासां चत्वारि शतानि शाखासु, कोष्ठे षट्षष्टिः, ग्रीवां प्रत्यूर्ध्वं चतुस्त्रिंशत् ।

शाखागत : 100 × 4 = 400
कोष्ठगत : 66
शिर एवं ग्रीवा : 34

सु.शा. 5/45 (शरीरसंख्याव्याकरणशारीरम्)

प्रत्यंगानुसार पेशी संख्या

शाखागत पेशी संख्याः (400)

एकैकस्यां तु पादाङ्गुल्यां तिस्रस्तिस्रस्ताः पञ्चदश, दश प्रपदे, पादोपरि कूर्चसन्निविष्टास्तावत्य एव, दश गुल्फतलयोः, गुल्फजान्वन्तरे विंशतिः, पञ्च जानुनि, विंशतिरूरौ, दश वक्षणे, शतमेवमेकस्मिन् सक्थिन भवति; एतेनेतरसक्थि बाहू च व्याख्यातौ ॥

सु.शा. 5/46 (शरीरसंख्याव्याकरणशारीरम्)

प्रत्यंगानुसार पेशी संख्या

कोष्ठगत पेशी संख्या: (66)

तिस्रः पायौ, एका मेढ्रे, सेवन्यां चापरा, द्वे वृषणयोः, स्फिचोः पञ्च पञ्च, द्वे बस्तिशिरसि, पञ्चोदरे नाभ्यामेका, पृष्ठोर्ध्वसन्निविष्टाः पञ्च पञ्च दीर्घाः, षट् पार्श्वयोः, दश वक्षसि, अक्षकांसौ प्रति समन्तात् सप्त, वे हृदयामाशययोः, षट् यकृत्प्लीहोण्डु (न्दु) केषु ।

सु.शा. 5/47

(शरीरसंख्याव्याकरणशारीरम्)

* वृद्धवाग्भट्ट और गयी के मत में 60 ।

उर्ध्वजत्रुगत पेशी संख्याः (34)

ग्रीवायां चतस्रः, अष्टौ हन्वोः, एकैका काकलकगलयोः, द्वे तालुनि, एका जिह्वायां, द्वे ओष्ठयोः, द्वे नासायां, द्वे नेत्रयोः, गण्डयोश्चतस्रः, कर्णयोः द्वे, चतस्रो ललाटे, एका शिरसीति; एवमेतानि पञ्च पेशीशतानि ॥ सु.शा. 5/48 (शरीरसंख्याव्याकरणशारीरम्)

* गयी के मत में 40 पेशियाँ हैं ।

स्त्रियों की विशेष पेशियाँ (20)
स्त्रीणां तु विंशतिरधिका ।
दश तासां स्तनयोरेकैकस्मिन् पञ्च पञ्चेति, यौवने तासां परिवृद्धिः ॥
अपत्यपथे चतस्रः- तासां प्रसृते अभ्यन्तरतो द्वे, मुखाश्रिते बाह्य च वृत्ते द्वे, गर्भच्छिद्रसंश्रितास्तिस्रः, शुक्रार्तवप्रवेशिन्यस्ति एव पित्तपक्वाशययोर्मध्ये गर्भशय्या, यत्र गर्भस्तिष्ठति । सु.शा. 5/51 (शरीरसंख्याव्याकरणशारीरम्)
पुंसां पेश्यः पुरस्ताद्याः प्रोक्ता लक्षणमुष्कजाः ।
स्त्रीणामावृत्य तिष्ठन्ति फलमन्तर्गतं हि ताः ॥ सु.शा. 5/53

पेशी प्रकार
स्वरुप के अनुसारः
तासां बहलपेलवस्थूलाणुपृथुवृत्तह्रस्वदीर्घस्थिरमृदुश्लक्ष्ण कर्कशभावाः सन्ध्यस्थिसिरास्नायुप्रच्छादका यथाप्रदेशं स्वभावत एव भवन्ति ॥

सु.शा. 5/52

(शरीरसंख्याव्याकरणशारीरम्)

बहल (large), पेलव (small), स्थूल (thick), अणु (thin), पृथु (flat), वृत्त (dome shaped), ह्रस्व (short), दीर्घ (long), स्थिर (firm), मृदु (soft), श्लक्ष्ण (smooth), कर्कश (rough)

A/c to anatomy
Definition

- It is a contractile tissue.
- Brings about movement.
- Regarded as motors of the body. Types of muscles

3 types viz. skeletal, smooth and cardiac.

skeletal	smooth	cardiac
multinucleated	uninucleated	uninucleated
Nerve supply- somatic	Nerve supply- A.N.S	Nerve supply- A.N.S
Long & cylindrical	Spindle shaped	Short & cylindrical
voluntary	involuntary	involuntary
Present in limbs, etc.	Present in visceras, etc	Walls of heart

SKELETAL MUSCLE

Synonyms

Striped muscles, Striated muscles, Somatic muscles, Voluntary muscles Parts of Skeletal Muscle.

A. Two ends 1.Origin.

- it is one end of the muscle which mostly remains fixed during its contraction

2. Insertion

- It is the other end which mostly moves during its contraction.
- In the limb muscles, the origin is usually proximal to insertion.
- However, the terms origin and insertion, are at Itimes interchangeable, and at other times difficult to define, as in the intercostal muscles.
- Muscles of pharynx, oesophagus, and the diaphragm act as involuntary muscles.

B. Two Parts

1. Fleshy part

- Contractile, it is called the 'belly'.

2. Fibrous part

- Noncontractile and inelastic.
- When cord-like or rope-like, it is called tendon.
- When flattened, it is called aponeurosis.
- The tendon receives Golgi tendon nerve endings.
- Supplied by capillaries extending from the fleshy part.
- Supplied by the periosteal arteries of the bone where the tendon terminates or gets inserted.

STRUCTURE OF SKELETAL MUSCLE

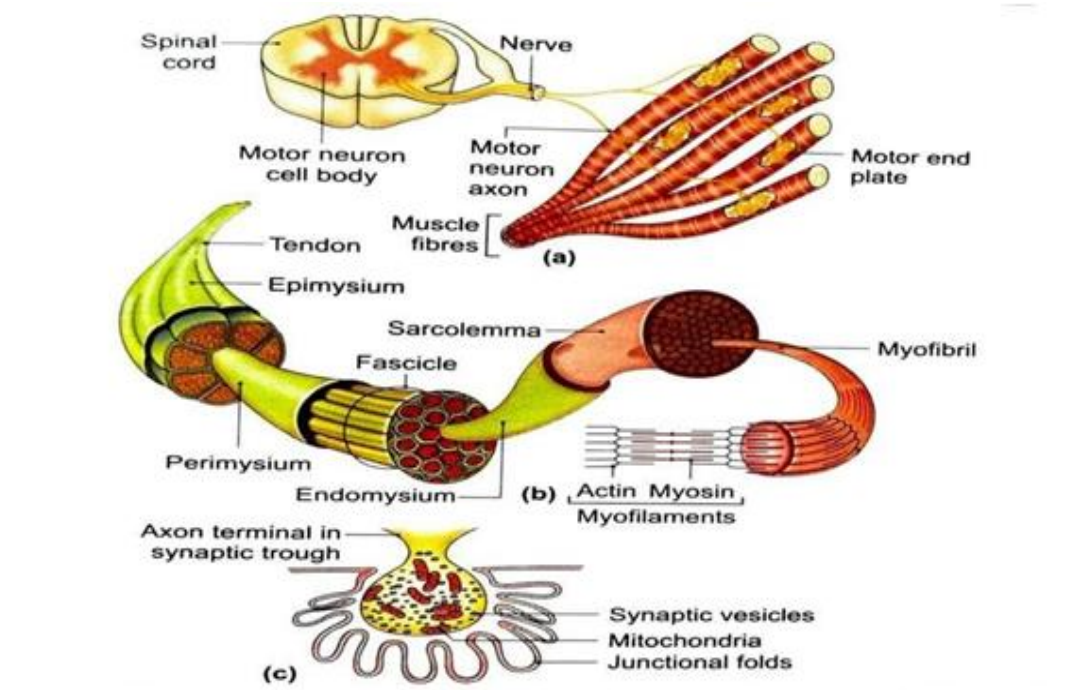
A. Contractile Tissue

- Each muscle is composed of numerous muscle fibres.
- Each muscle fibre is a multinucleated, cross-striated cylindrical cell (myocyte) 1-300 mm long.
- It is made up of sarcolemma (cell membrane) enclosing sarcoplasm (cytoplasm).
- Embedded in the sarcoplasm there are.

(a) several hundred nuclei arranged at the periphery beneath the sarcolemma.

(b) A no. of evenly distributed longitudinal threads called myofibrils.

- Each myofibril shows alternate dark and light bands.
- Dark bands are known as A bands (anisotropic) & the light bands as I bands (isotropic).
- The bands of adjacent fibrils are aligned transversely so that the muscle fibre appears cross- striated.
- In the middle of dark band there is a light H band.
- In the middle of I band there is a dark Z line or Krause's membrane.
- The segment of myofibril between two Z lines is called sarcomere.
- Muscle- Fascicule- fibres- myofibril- myofilaments Supporting Tissue:
- Help in organization of the muscle.
- Endomysium surrounds each muscle fibre separately.
- Perimysium surrounds bundles (fasciculi or myonemes) of muscle fibres of various sizes.
- Epimysium surrounds the entire muscle.
- The connective tissue of the muscle becomes continuous with the tendon.



Supporting tissue of a muscle. Nerve supply to muscle fibres also shown (a) nerve supply to muscle fibres; (b) supporting tissue of a muscle; (c) motor end plate

Types of Fibres

1. Type I (Slow) Fibres

- Show a slow 'tonic' contraction characteristic of postural muscles like gluteus maximus.
- Red in colour bcoz. of large amounts of myoglobin.
- Fibres are rich in mitochondria & oxidative enzymes, but poor in phosphorylases.
- Bcoz. of a well - developed aerobic metabolism, slow fibres are highly resistant to fatigue.

2. Type II (Fast) Fibres

- Show a fast 'phasic' contraction required for large-scale movements of body segments.
- These are paler (white) in colour bcoz. Of small amounts of myoglobin.
- The fibres are rich in glycogen and phosphorylases, but poor in mitochondria & oxidative enzymes.
- Bcoz. of a glycolytic respiration, the fast fibres are quite easily fatigued.

3. Intermediate fibres

- Represent a variant of type II (fast) fibres.
- Relatively resistant to fatigue. Although less than type I (slow) fibres
- In man, most of the skeletal muscles show a mixture of fibre- types, but any one type may predominate.

Fascicular Architecture of muscles

- The arrangement of muscle fibres varies according to the direction, force and range of habitual movement at a particular joint.
- Force of movement is directly proportional to no. and size of muscle fibres.
- Range of movement is directly proportional to the length of fibres

Muscles can be classified according to the arrangement of their fasciculi into the following groups.

A. Parallel Fasciculi

When the fasciculi are parallel to the line of pull, the muscle may be:

- Quadrilateral (thyrohyoid)
- Strap-like (sartorius and sternohyoid)
- Strap-like with tendinous intersections (rectus abdominis)
- Fusiform (biceps brachii, digastric, etc.)- the range of movement in such muscles is maximum.

B. Oblique Fasciculi

- When the fasciculi are oblique to the line of pull, the muscle may be triangular, or pennate (feather-like) in the construction.
- Thus the muscle become more powerful.
- Rahge of movement is reduced: Types.
- Triangular (temporalis, adductor longus)
- Unipennate (flexor pollicis longus, extensor digitorum longus, peroneus tertius, palmar interossei)
- Bipennate (rectus femoris, dorsal interossei, peroneus longus, flexor hallucis longus)
- Multipennate (subscapularis, deltoid-acromial fibres)
- Circumpennate (tibialis anterior)

C. Spiral or Twisted Fasciculi Spiral or twisted fibres are found in.

Trapezius, Pectoralis major, Latissimus dorsi, Supinator

etc.

D. Crossed Fasciculi
These are called cruciate muscles.e.g. Sternocleidomastoid, Masseter, Adductor magnus Naming the muscles.

Features used in naming muscles
1. Shape
2. Size
3. Number of Heads
4. Attachment
5. Depth
6. Position
7. Structure
8. Action

Naming muscles on the basis of SHAPE.
- Triangular- Deltoid
- Quadratus (quadrangular)- quadratus femoris
- Rhomboid (diamond shaped)- rhomboid major
- Teres (round)- teres major
- Gracilis (slender)- gracilis
- Lumbrical (worm like)- lumbricals of palm
- Rectus (straight) -rectus abdominis Naming muscles on the basis of SIZE:
- Major (big)- pectoralis major
- Minor (small)-pectoralis minor
- Longus (long)- adductor longus
- Brevis (small)- abductor pollicis brevis
- Latissimus (broadest)- latissimus dorsi
- Longissimus (longest)- longissimus thoracis Naming muscles on the basis of Number of Heads:
- Biceps (two heads) -biceps brachii
- Triceps (three heads) - triceps brachii
- Quadriceps (four heads) - quadriceps femoris
- Digastric (two bellies)- anterior & post. Bellies of digastric.

Naming muscles on the basis of Attachment.
- Sternocleidomastoid- from sternum and clavicle to mastoid process.
- Brachialis- from humerus to ulna
- Coracobrachialis - from coracoid process to the arm (brachium)

Naming muscles on the basis of DEPTH.
- Superficialis (superficial)- flexor digitorum Superficialis
- Profundus (deep)- flexor digitorum Profundus
- Externus (external) - external oblique of anterior abdominal wall
- Internus (internal)- internal oblique of anterior abdominal wall Naming muscles on the basis of POSITION:
- Anterior (front)-tibialis anterior
- Posterior (back)- tibialis posterior
- Lateralis (lateral side)- vastus lateralis
- Medialis (medial side)- vastus medialis
- Superior(upper side)-superior rectus of eyeball
- Inferior (lower side)- inferior rectus of eyeball
- Supra (above)- supraspinatous
- Infra (lower)- infraspinatous
- Dorsi (of the back)- latissimus dorsi
- Brachii (of the arm)- biceps brachii
- Femoris (of the thigh)- rectus femoris
- Oris (of the mouth)- orbicularis oris
- Oculi (of the eye)- orbicularis oculi Naming muscles on the basis of STRUCTURE:
- Half muscle, half tendon - semitendinosus
- Serrated edge - serratus anterior Naming muscles on the basis of ACTION:
- Extensor(increase the angle)-extensor pollicis longus
- Flexor(decrease the angle)-flexor pollicis longus
- Abductor(take away)- abductor digiti minimi
- Adductor(take towards midline)-adductor pollicis
- Levator (to elevate)- Levator scapulae
- Depressor(to pull down)-depressor anguli oris
- Supinator(turning palm anteriorly)- supinator
- Pronator(turning palm posteriorly)-pronator teres
- Dilator(to dilate)- dilator pupillae
- Abduction of digits-dorsal interossei

NERVE SUPPLY OF SKELETAL MUSCLE
- The nerve supplying a muscle is called motor nerve.
- In fact it is a mixed nerve.
- Consists of following types of fibres:

1. Motor fibres (60%)
2. Sensory fibres (40%)

Motor Fibres (nerves)		
Alpha (α)efferents	Gamma (γ)efferents	Smooth muscle efferents
Large myelinated fibres	Smaller myelinated nerve fibres	Fine non- myelinated autonomic efferents
Supply extrafusal muscle fibres	Supply intrafusal fibres of the muscle spindles	Supply smooth muscle fibres of the blood vessels.
Ends at motor end plate	Refine and control muscle contraction	

Sensory fibres
- myelinated
- Distributed to muscle spindle and tendons
- Proprioception Muscle spindle
- Part of skeletal muscle.
- Spindle shaped.
- Sensory end- organs
- Act as stretch receptors.
- Record and help regulate the degree and rate of contraction of extra-fusal muscle fibres by influencing the (alpha)- neurons acting on 'motor-end plates.'
- Each spindle contains 6-14 intrafusal muscle fibres. (2 types viz.)

1) Larger (Nuclear-bag fibres)
2) Smaller (Nuclear chain fibres) Nerve-supply of Muscle-spindles Sensory nerves: (2 types viz.)

1) Primary sensory endings (annulospiral endings)
- Around central nuclear region of the intrafusal fibres.

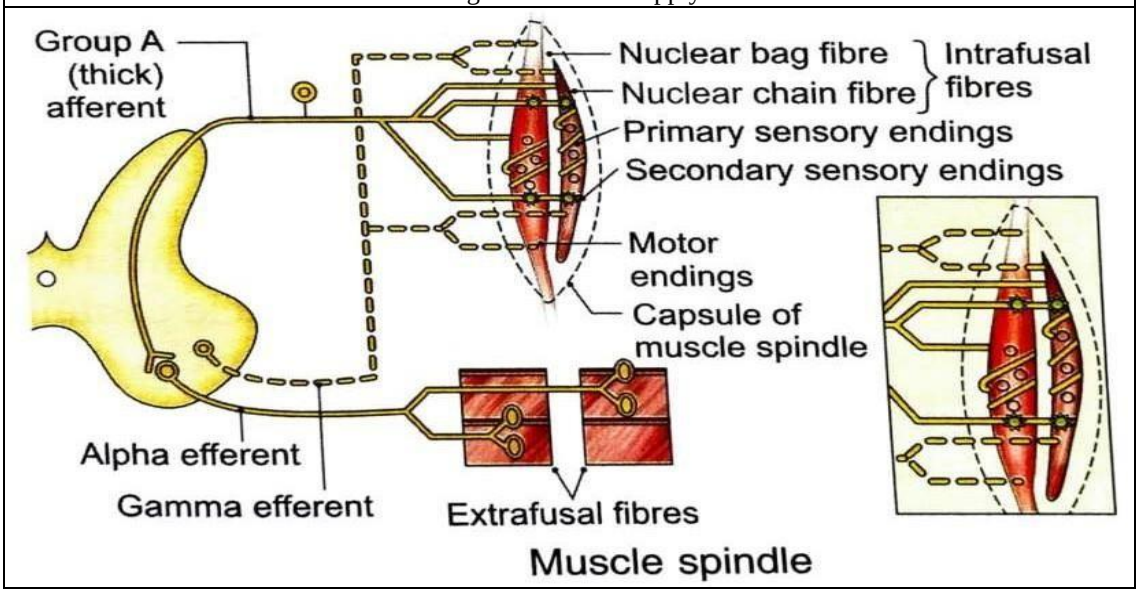
2) Secondary sensory endings (Flower spray endings)
- Beyond the nuclear region on either side of these fibres.

Motor nerves
- derived from Y (gamma) motor neurons of the spinal cord.

Motor point
- Is the site where the motor nerve enters the muscle.
- May be one or more than one.

Motor unit
- Single alpha motor neuron together with the muscle fibres supplied by it.
- Size depends upon the precision of muscle control.
- Small motor units (5-10 muscle fibres) are found in muscles of fine movements (extraocular muscles)
- Large motor units (100-2000 muscle fibres) are found in muscles of gross movements (proximal limb muscles).

Schematic diagram of neural supply of muscles



Composite / hybrid muscle
- Muscle supplied by two different motor nerves with different root values. examples:

1) Adductor magnus
- Adductor part-obturator nerve (L 2,3,4)
- Hamstring part-sciatic nerve (L 4,5,5 1,2,3)

2) Flexor digitorum profundus
- Part destined for index & middle fingers: median nerve (C 5,6,7,8,T1)
- Part destined for ring and little fingers: ulnar nerve (C 7,8,T1) Vascular pedicle
- it is the pedicle containing one vein & one artery for the supply of skeletal muscle.
- Knowledge is useful in muscle grafting

Type I	Type II	Type III	Type IV	Type V
Muscle with only one pedicle	1 main & few small pedicles	2 main pedicles	Many pedicles	One main &many smaller pedicles
Tensor Fascia lata	gracilis	Gluteus maximus	Sartorius	Latissimus dorsi

Nerve supply of smooth muscle

According to nerve supply the smooth muscles are classified into.

1) Single-unit type

- Seen in intestines
- Impulse is transmitted by the mechanical pull through the fused cell membrane.
- Nerve supply is sparse

2) Multi-unit type

- Seen in ductus deferens
- Each M.fibre receives a separate N.fibre.
- Contraction is simultaneous
- Nerve supply is rich

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