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Lateral Facets and Lateral Joints in the Lumbar Spine of the Horse—A Descriptive and Statistical Study

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SUMMARY

Increase in the size of an animal imposes great muscular disadvantage for locomotion. The stride varies directly with the length of the animal and the muscle pull with the square of the length, but the weight varies with the cube of the length. Momentum is increased inordinately since it is the product of speed and mass.

This disadvantage in large animals such as horse, ox, camel, and elephant is compensated for by relative stability or stiffness of the caudal or posterior spine. The horse, being not only large and powerful but also very fast, has great need for such stability. In the horse, stability is augmented by lateral joints in the caudal lumbar region. These joints are unique to this species and are found in all horses, domestic, wild, or prehistoric. Joints have been found to vary in number from four to seven. The number seems to be largely dependent upon the length of the lumbar spine; *i.e.*, the number of lumbar vertebrae. Of 52 horses with 5 lumbar vertebrae, 48 had 4 lateral joints, 2 had 5, and 1 had 6. Of 185 horses with 6 lateral vertebrae (1 of them had 7), 82 had 4 lateral joints, 19 had 5, and 85 had 6. Stability of the lower lumbar spine in the domestic horse was frequently found to be further increased by ankylosis of lateral joints.

Flexion and extension of the caudal spine is almost completely limited to the lumbosacral joints. This was never found to be impaired in any way in the series of 245 horses.

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This study was begun at Eaton's Ranch, Wolf, Wyo., where fragments of about 20 horse skeletons were gathered in the field with the express permission and cooperation of Bill Eaton and Thomas Butler. Thirteen lumbar and sacral spines were provided by Frank Nagy of Elyria, Ohio.

INTRODUCTION

All species of the genus *Equus* are characterized by auxiliary joints lateral to the vertebral bodies of the caudal lumbar vertebrae. They have been seen in every skeleton examined and have not been observed in any other species. Little or no mention is made of them in books on anatomy of the horse, and no adequate description of them has been found. Since they effectively stabilize this portion of the spine against lateral motion, they are worthy of consideration, and a careful description of their development, occurrence, distribution, and function is warranted.

Review of Literature

A superficial survey of the literature indicated that lateral joints have been largely neglected.

Ruini[3] in 1599 published lateral views of the horse's skeleton allowing identification of 6 lumbar vertebrae, 5 sacral vertebrae, and 11 caudal vertebrae. Lateral facets and joints can be identified in some of the illustrations. Two facets are shown on the cephalad ends of the ilia, caudal and cephalad surfaces of the sixth lumbar vertebra, and caudal surfaces of the fifth lumbar vertebra, a total of four lateral joints. No description of these features was found.

Snape[6] copied many of the plates used by Ruini showing the same features mentioned previously. Figure 6 of Snape's Table 42 ''shows the last vertebra of the loins with that side forwards whereby it was joined with the next one, in which vertebra is to be seen the hole where the spinal marrow did pass through it.'' Figure 8 ''shows the same bone with that side uppermost that respects the cavity of the body.'' All of the figures in Table 42 show lateral facets on the sacrum and the last two lumbar vertebrae. Nowhere is there mention by name or description of lateral facets or lateral joints. Sisson and Grossman[5] state, ''Those (transverse processes) of the fifth (lumbar vertebrae) have an oval concave facet on the inner part of the posterior border for articulation with the wing of the sacrum. Sometimes the fourth process has a small surface for articulation with the fifth.''

Observations

The skeletal material used for this study was described in the report on anatomical variations of the spine of the horse[8] and in a previous study of ankylosing diseases of the spine of the horse.[7] The study was made on horse bones macerated by the weather, fresh skeletal material from a horse butcher, and specimens examined personally in numerous zoological museums in America and Europe. The source of this material, its extent, and its variety, is listed (Table 1).

Lateral joints are formed by a pair of cartilage-covered lateral facets opposite each other on the cephalad end of the sacrum and on the cephalad and caudal edges of the lateral processes of the last several lumbar vertebrae. They are roughly oval or triangular areas, convex on the cephalad surface and concave on the caudal surface, varying from larger in the area of the end of the vertebral body in the sacrum and the last lumbar vertebrae to considerably smaller as they are found cephalad. They vary in number; at least 4 are always present, but 6 are often found, 5 occur at times, and one skeleton was seen with 7.

A thoracic view of a horse's spine with four lateral joints is shown (Fig. 1). This horse had 6 lumbar vertebrae; he was mature, and the lateral joints were all completely normal as was all of the spine which was seen. The ventral view of a horse's spine with 6 lateral joints is shown (Fig. 2). The left lateral joint between the fifth and sixth lumbar vertebrae was fused and obliterated, and the lateral processes on that side had grown together. The spine was otherwise normal. A posterior view of the vertebral bodies, the lateral processes, and the lateral facets of the caudal ends of the fourth, fifth, and sixth lumbar vertebrae is shown (Fig. 3). The lateral facets on the sixth lumbar vertebra were oval and had a larger area than that of the vertebral body. Those on the fifth lumbar vertebra were smaller and more nearly triangular. Only one lateral facet was seen on the fourth lumbar vertebra, that on the right lateral process, because this horse had only 5 lateral joints. Lateral facets are always separated from the subchondral plate of the intervertebral disk by a small space or groove.

Lateral joints are not present at birth but develop soon thereafter. Eight skeletons are recorded as 36 hours, 4 days, or 6 weeks old, or ''very young'' without lateral joints being discernible. Nine other skeletons listed as 17 months, 2 years, or 3 years old, and five listed as very young, had well-developed lateral joints.

TABLE 1—Spine of the Horse—Source of Material Studied

Species	Institution *															Totals
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Domestic horse	24	7	8	4	4	2	2	1	....	3	6	5	....	....	28	94
Shetland pony	3	....	....	....	1	....	....	....	2	....	1	....	....	....	1	8
Zebra	30	8	3	....	3	3	3	5	2	....	....	3	....	....	....	60
Grevy zebra	9	4	2	....	....	....	....	....	2	....	....	....	....	....	....	17
Hybrid mule	5	....	2	....	....	....	....	....	....	....	....	....	....	....	1	8
Ass	6	....	2	....	3	....	1	2	2	....	....	....	....	....	2	18
Hemione	5	2	1	....	....	....	....	....	1	....	....	....	....	....	....	9
Arabian	8	1	....	....	....	....	....	1	....	....	....	....	....	....	....	10
Prjevalsky horse	7	2	....	....	....	....	....	....	5	2	....	....	4	1	....	21
Totals	97	24	18	4	11	5	6	9	14	5	7	8	4	1	32	245

* Names and locations of institutions: (1) American Museum of Natural History, New York, N.Y. (2) United States National Museum, Smithsonian Institution, Washington, D.C. (3) Museum of Comparative Zoology, Harvard University, Cambridge, Mass. (4) School of Veterinary Medicine, University of Pennsylvania, Philadelphia. (5) Chicago Museum of Natural History, Chicago, Ill. (6) Cleveland Museum of Natural History, Cleveland, Ohio. (7) Musée Royal de Congo Belge, Tervuren, Belgium. (8) Institut Royal des Sciences Naturelles de Belgique, Brussels. (9) Laboratoire d'Anatomie Comparée, Muséum National d'Histoire Naturelle, Paris. (10) Zurich Zoological Society, Zurich. (11) Veterinär-Anatomisches Institut der Veterinäri-Medizinischen Fakultät der Universität, Zurich. (12) Hochschule für Bodenkultur, Vienna. (13) British Museum, London. (14) Institut für Agricultural Zoologie, University of Halle, Germany. (15) Private collection.

TABLE 2—Lateral Joints in the Lumbar Vertebrae of 245 Equine Animals

Animals studied	Five lumbar vertebrae				Six lumbar vertebrae					Not counted *	Totals
	No. of animals	No. of lateral joints			No. of animals	No. of lateral joints					
		4	5	6		5	5	6	7		
Domestic horse	7**	5	1	1	86	35	12	38	1	1	94
Shetland pony	....	....	....	....	8	6	....	2	....	....	8
Zebra	5	5	....	....	53	23	4	26	....	2	60
Grevy zebra	1	1	....	....	16†	6	1	9†	....	....	17
Hybrid mule	1	....	....	....	6	3	1	2	....	1	8
Ass	15	14	1	....	2	1	....	1	....	1	18
Hemione	9	9	....	....	....	....	....	....	....	....	9
Arabian	3	3	....	....	7	3	1	3	....	....	10
Prjevalsky horse	11	11	....	....	7	5	....	2	....	3	21
Totals	52	48	2	1	185	82	19	83	1	8	245

* Lateral joints had not yet formed. ** Two horses had 5½ lumbar vertebrae. † One Grevy zebra had 7 lumbar vertebrae.

The occurrence of lateral joints in 245 horses of nine species is shown (Table 2). Of these 245 horses, 8 were young animals in which lateral joints were not identified. The horses are classified according to whether they had 5 lumbar vertebrae or 6 lumbar vertebrae. Of 52 horses with 5 lumbar vertebrae, 48 had 4 lateral joints, 2 had 5 lateral joints, and 1 only had 6 lateral joints. Of 185 horses with 6 lumbar vertebrae, 82 were found to have 4 lateral joints, 19 had 5 lateral joints, and 85 had 6 lateral joints. One domestic horse with 6 lumbar vertebrae had 7 lateral joints. No significant difference in distribution of animals with 4, 5, or 6 lateral joints was seen between the different species of horses.

Sacral vertebrae have been described by Schultz and Straus[4] as follows: ''Sacral vertebrae = the vertebrae composing the sacrum and possessing intervertebral and sacral foramina ringed completely by bone in the adult. Actual osseous fusion is not necessary, but contact between the sacral wing portions of adjoining vertebrae, lateral to the sacral foramina, must exist in either a bony or cartilaginous state. The number of sacral vertebrae equals half the number of sacral foramina plus one. The number of sacral foramina, however, at times can differ on the two sides in consequence of asymmetrical formations at either end of the sacral region. Such transitional lumbosacral or sacro-caudal vertebrae are classified by half segments.''

According to this definition, it can be seen that the lateral processes do meet and form ''intervertebral and sacral foramina ringed completely by bone in the adult. Actual osseous fusion is not necessary, but contact between the sacral wing portions of adjoining vertebrae, lateral to the sacral foramina, must exist in either a bony or cartilaginous state.[4]'' Thus, it can be seen that vertebrae with lateral facets do qualify to some extent as sacral vertebrae. They ordinarily do not make contact with each other throughout the length of the lateral processes, nor do the lateral processes articulate with the iliac bones. Such lumbar vertebrae with lateral facets have been

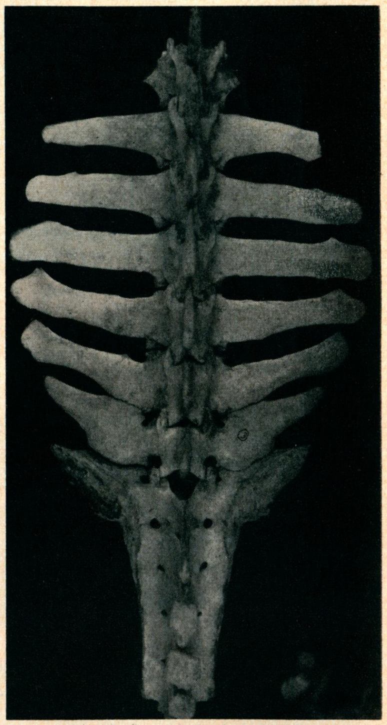


Fig. 1—Dorsal view of the last dorsal, 6 lumbar vertebrae, and the sacrum of a horse. Lateral joints are seen between the last 2 lumbar vertebrae and the last lumbar vertebra and the sacrum. The last lateral joints are seen to be at an angle of about 30 degrees to the transverse line.

Fig. 2—Ventral view of 6 lumbar vertebrae and the sacrum showing 6 lateral joints. The lateral joint on the left side of the horse (right side of the picture) is obliterated, and the lateral processes are fused throughout nearly their entire length.

described as pseudosacral vertebrae but are considered in this study as lumbar vertebrae.

Discussion

In order to understand the function of the lateral joints, it is desirable to discuss some particular features of the horse. According to Hildebrand,[1] the speed at which an animal can run is a function of the length and duration of its stride. Each of these factors is related to the body size. If it were possible to disregard mass, animals of like form would run at the same speed regardless of body size, because the length of stride varies in direct proportion to body length, whereas intrinsic rate of muscle contraction is the same and, hence, rate of stride varies inversely with the length of muscle. The force of contraction of a muscle is proportional to the cross section of its fibers, therefore the square of linear measure. The mass of the body varies with the cube of linear measure. If the linear measure of a muscle is doubled, the strength of its pull is increased to the second power or 4 times, but its weight or mass is increased to the third power or 8 times the original weight. The length of the stride is only doubled. Increase in size places muscle at a considerable disadvantage.

The horse has been described as the most efficient running machine in nature. Although not the fastest for short spurts, he has an extraordinary capacity for sustained speeds and, therefore, for covering long distances. He is a large animal, however, so that serious mechanical problems are involved. It is no wonder that the

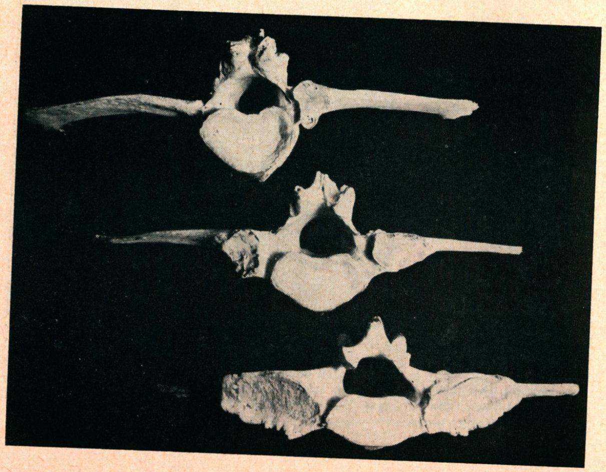


Fig. 3—Posterior view of the fourth, fifth, and sixth lumbar vertebrae showing two lateral facets on the fifth and sixth and one lateral facet on the right of the fourth vertebrae. This animal had 5 lateral joints. Notice that the lateral facets, and consequently the lateral joints, are separated from the intervertebral disk.

horse runs inefficiently; it is a wonder that he runs at all. A large animal must have a modified form and function of its body to reduce the load placed on muscles and the supportive tissues in order to avoid impossible stresses. Since momentum is the product of mass and velocity, considerable advantage can be obtained by minimizing the motion of one part of the body to another. The heavy-bodied horse, therefore, holds its back nearly rigid.

The stability of the horse's spine in running is in marked contrast to the flexibility of the dog or cat. As Muybridge[2] has shown, the large heavy animals, the horse, elephant, ox, and camel, keep the thoracic and lumbar spines practically straight while running, but cats and dogs flex them sharply. It is presumed that this characteristic is an inherited one for the species rather than dependent entirely upon body size. It seems likely that the smallest Shetland pony has a rigid back while a large dog, larger than the pony, has spinal flexibility.

Flexion of the horse's spine, beyond the cervical region, is seriously limited. The tips of the spinous processes are so arranged that there is little room for extension of the spine. This limitation is great throughout the length of the body. At the lumbosacral junction, a greater range of motion is possible because the spinous processes of the lumbar vertebrae point cephalad, and those of the sacrum point caudad, leaving a large gap between them and allowing considerable extension at this point (Fig. 4). The intervertebral disks in the lumbar region are thick with flat parallel surfaces. The last one, however, connecting the last lumbar vertebra to the sacrum, is flat transversely but is rounded and convex dorsoventrally. Examination of fresh skeletons with the muscle removed showed a reasonable degree of flexibility in the lumbosacral region. The lateral joints between the last lumbar vertebra and the sacrum are in a different plane from that of the disk. The plane of the lateral joints here, as measured in the sacrum, forms an angle of 10 to 30 degrees from that of the last vertebral disk. They are placed slightly posterior to the disk, and their surface points forward and dorsally, rather than forward and ventrally as does the disk. When flexion occurs at these joints, there is a rocking motion only of the disk but a definite sliding motion of the lateral joints. The cartilage of the disk is thick and elastic and serves as a cushion against shocks. The cartilage of the lateral joints is thin; it serves no elastic purpose and acts only as a lubricated sliding surface with a minimum of friction.

The motion of the lumbosacral joint is shown (Fig. 5) in a photograph of the ventral surface of the last lumbar vertebra and the sacrum, viewed caudally with the spine in extension. The ventral surfaces of the vertebral bodies are nearly in line with each other. The lateral facets of the sacrum have been partially uncovered by the gliding dorsal movement of the facets of the last lumbar vertebra. This uncovering action is more marked laterally than nearer the midline because of the angles at which the joint surfaces are placed. The farther they are from the midline, the farther the joint surfaces are away from the fulcrum, so they turn on a longer radius.

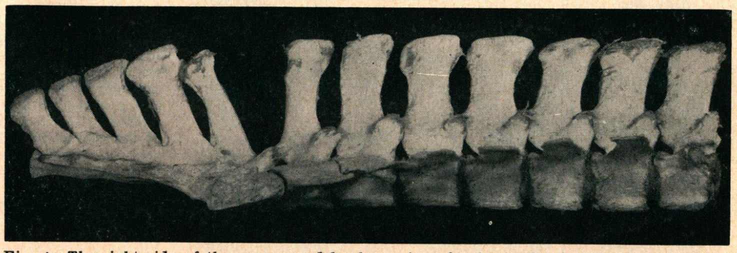


Fig. 4—The right side of the sacrum and lumbar spine of a horse showing the free space between the spinous processes of the first sacral and the last lumbar vertebrae allowing free extension in this region. The tips of the spinous processes of the lumbar spine are so close together as to seriously limit extension here.

Fig. 5—A view of the ventral surface of the last lumbar vertebra and the sacrum looking posteriorly or toward the tail. The bones are placed as in extension showing the centra nearly in line with each other, but the lateral facets of the lumbar vertebrae have glided dorsally, exposing the ventral margin of the sacral lateral facets.

Fig. 6—A reconstructed radiograph of the lateral view of the lumbar spine to the left and the sacrum to the right. This radiograph was taken so as to show the wide intervertebral disk in the center with the lateral joint below and the intervertebral joint above. The joint surfaces of the centra and the lateral facets are opposite each other, but those of the intervertebral joint are opposed through only two-thirds of their surfaces. The spinal fragment was split longitudinally, and only one-half was used.

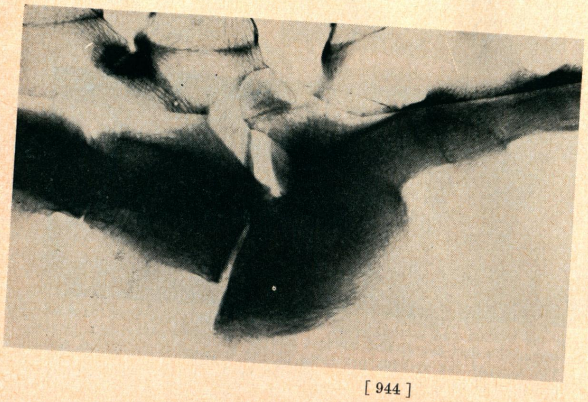
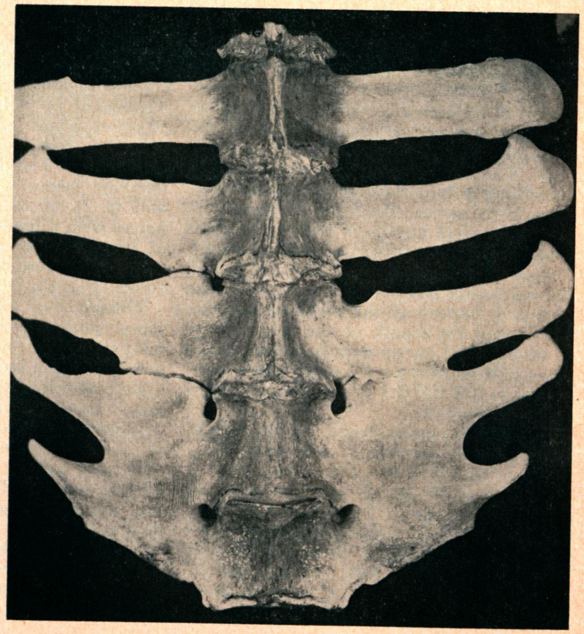


Fig. 7—The same specimen as is shown in Figure 6 but in marked extension. The opposing surfaces of the vertebral centra are still opposite each other, but the rocking motion is demonstrated. The lateral facet of the sacrum has glided ventrally, an action which is greatly accentuated by the angle at which the radiograph was taken. The surfaces of the apophysial joint are now opposed to each other.

Lateral radiographs were made of the lumbosacral spine of a freshly killed animal with the muscles removed. The specimen had been divided longitudinally. The radiographs were directed toward the bodies of the vertebrae from a point somewhat dorsal to a true lateral position. They were also directed a little caudally, toward the sacrum, to pass parallel to the surfaces of the lateral joints. These are not truly lateral views and some distortion has resulted, but these adaptations were necessary to avoid superimposing the lateral joints on the intervertebral disk. The spine and the sacrum in their normal positions are shown (Fig. 6). The intervertebral disk, seen in a vertical position, is quite thick with parallel surfaces in the middle of the picture. The lateral joint is seen below it because of the angle at which the picture was taken. The joint space representing cartilage is quite narrow, and the joint surface is at an angle of about 20 degrees from that of the intervertebral disk. The intervertebral joint is seen directly above the disk. It is placed nearly horizontally; the joint space is thin, and the opposing joint surfaces are in contact through only about two-thirds of their length. The angle between the spinous processes of the last lumbar vertebra and the sacrum is quite wide, about 50 degrees. The same specimen in extreme extension is shown (Fig. 7). The surfaces of the intervertebral disk are no longer parallel, the lumbar position of the lateral joint has glided dorsally, the surfaces of the intervertebral joint are now directly opposed to each other, and the angle between the spinous processes has been reduced to about 25 degrees.

These 5 joints, the intervertebral disk, the 2 lateral joints, and the 2 intervertebral joints are so arranged as to provide maximum stability against dislocation of the lumbosacral joint. When viewed from the dorsal or the ventral surface, the lateral joints, of the lumbosacral area particularly, form a shallow "V" as protection against lateral dislocation. When viewed

Fig. 8—Ventral view of the last 5 lumbar vertebrae from a horse with 7 lateral joints, 3 of which are ankylosed. The last 2 are obliterated by fusion of the adjacent edges of the lateral processes. This was a young horse as shown by the open epiphyses on the ends of the vertebral bodies.



laterally, the sacral portions of the lateral joints face a little dorsally rather than being parallel to the intervertebral disk, and the sacral portion of the intervertebral joint faces dorsally. The position of these two sets of joints serves admirably to prevent dorsal subluxation of the sacrum, a potential hazard in view of the powerful turning movement transmitted to the pelvis by the massive gluteal extensor muscles.

The lumbar spine is subject to great strain in all directions whenever a horse is running, trotting, or pacing because of the mass of the legs and the power of the muscles. The bracing described previously is functionally important in the caudal portion of the spine. The stress at this point is greater than anywhere else in the spine just as it is in a fence post which usually breaks off at the ground. The number of lateral joints has nothing to do with the habits or hazards of the horse. It depends only upon the length of the spine. Only 3 (6%) of 48 horses with 5 lumbar vertebrae had more than 4 lateral joints compared to 104 (57%) of 185 horses with 6 lumbar vertebrae.

A further characteristic of the lateral joints is the frequency with which they become immobilized. The occurrence of ankylosis of the lateral joints as observed in 245 skeletons of 9 species of horse is shown (Table 3). No lateral joints were found in 8 skeletons because they had not yet developed. Anklyosis was not observed in horses living in the wild state. In 7 horses with 5 lumbar vertebrae, ankylosis was seen in 6 of 14 lateral joints between the fourth and fifth lumbar vertebrae. In animals with 6 lumbar vertebrae, 69 joints between the fifth and sixth lumbar vertebrae were found to be ankylosed in 86 horses, 4 in 7 hybrids, 5 in 10 Arabians, and 2 in 8 Shetland ponies. Such ankylosis has the effect of shortening the spine or at least reducing the number of its functioning units. In certain specimens, ankylosis of lateral joints was augmented by actual fusion between the adjacent edges of the lateral processes (Fig. 2). Such fusion of lateral processes occurred in 2 of 6 ankylosed joints of 7 domestic horses with 5 lumbar vertebrae and in 26 of 69 ankylosed joints of 86 horses with 6 lumbar vertebrae. Anklyosis of lateral joints sometimes occurs before maturity, before the epiphysial joint has fused (Fig. 8).

Flexion and extension of the lumbosacral joint is relatively free. Ankylosis or pathologic change restricting motion has never been seen in this joint.

Lateral joints seem to be unique in the genus *Equus*. This well-developed system of support and stability for the lower spine is unique in the horse and is independent of weight bearing or pulling in a harness. These joints are found in all wild species and are also present in fossil horses such as the three-toed forest horse *Hyohippus*, the *Neohippus*, the *Pliohippus*, the *Plesippus*, and the extinct North American wild horse on display at the American Museum of Natural History, New York, N.Y.

TABLE 3—Lateral Joints in the Lumbar Vertebrae in 245 Equine Animals

	Five lumbar vertebrae				Six lumbar vertebrae						
		No. of lateral joints				No. of lateral joints					
Animals studied	No. of animals	Sacrum-L5	L5-4	L4-3	No. of animals	Sacrum-L6	L6-5	L5-4	L4-3	Not counted	Totals
Domestic horse	7**	14	8(6)	3	86†	172	103(69)	74(2)	1	1	94
Shetland pony	....	....	....	....	8	16	14(2)	2	....	....	8
Zebra	5	10	10	....	53	106	106	56	....	2	60
Grevy zebra	1	2	2	....	16‡	32	32	19	....	....	17
Hybrid mule	1	2	2	....	6	12	8(4)	5	....	1	8
Ass	15	30	30	1	2	4	4	2	....	1	18
Hemione	9	18	18	....	....	....	....	....	....	....	9
Arabian	3	6	6	....	7	14	9(5)	7	....	....	10
Prjevalsky horse	11	22	22	....	7	14	14	6	....	3	21
Totals	52	....	....	....	185	....	....	....	....	8	245

* Lateral joints had not yet formed. ** Two horses had 5½ lumbar vertebrae. † One horse had 7 lateral joints, 3 of which were ankylosed. ‡ One Grevy zebra had 7 lumbar vertebrae.
Parentheses indicate number of ankylosed lateral joints.

References

1. Hildebrand, M.: Motions of the Running Cheetah and Horse. Mammalogy, 40, (1959): 481–495.
2. Muybridge, Eadweard: Animals in Motion. Dover Publications, New York, N.Y., 1957.
3. Ruini, Carlo: Anatomia del Cavàllo, Infermità, et soui Rimèdii. Venetia, Bindoui, 1599.
4. Schultz, Adolph, and Straus, William L., Jr.: The Numbers of Vertebrae in Primates. Proc. Am. Philos. Soc., 89, (1945): 601–626.
5. Sisson, Septimus, and Grossman, J. D.: Anatomy of the Domestic Animals. 4th ed. W. B. Saunders Co., Philadelphia, Pa., 1955.
6. Snape, Andrew J.: The Anatomy of an Horse. Flesher, London, 1683.
7. Stecher, Robert M., and Goss, Leonard J.: Ankylosing Lesions of the Spine of the Horse. J.A.V.M.A., 138, (Feb. 1, 1961): 248–255.
8. Stecher, Robert M.: Anatomical Variations of the Spine in the Horse. J. Mammalogy, 43, (1962): 205–219.

SUMMARIO IN INTERLINGUA

Faciettas Lateral e Articulationes Lateral in le Rhachide Lumbar del Cavallo. Un Studio Descriptive e Statistic

Augmentos dimensional in un animal impone un grande disavantage con respecto al locomotion. Le longor del passo varia directemente con le longor del animal, le traction muscular con le quadrato del longor, sed le peso con le cubo del longor. Le momento es augmentate enormemente, proque illo es le producto de velocitate e massa.

Iste disavantage in grande animales, como le cavallo, le bove, le camelo, le elephante, es compensate per un relative stabilitate o rigiditate del rhachide caudal o posterior. Le cavallo, que es non solmente grande e potente sed etiam rapidissime, ha un grande necessitate de un tal stabilitate. In illo, le stabilitate es augmentate per articulationes lateral in le region caudo-lumbar. Iste articulationes es unic in iste specie e es incontrate in omne cavallos, domestic, salvage, e prehistoric. Ha essite trovate que illos varia in numero inter quatro e septe. Il pare que iste numero depende in grande mesura del longor del rhachide lumbar, i.e. del numero del vertebras lumbar. De 52 cavallos con 5 vertebras lumbar, 48 habeva 4 articulationes lateral, 2 habeva 5, e 1 habeva 6. De 185 cavallos con 6 vertebras lumbar (incluse 1 con 7), 82 habeva 4 articulationes lateral, 19 habeva 5, e 85 habeva 6. Esseva etiam trovate que le stabilitate del rhachide infero-lumbar in le cavallo domestic esseva augmentate additionalmente in multes del casos per ankylosis de articulationes lumbar.

Flexion e extension del rhachide caudal es limitate quasi completemente al articulationes lumbosacral. Isto esseva nunquam compromittite in ulle maniera in le complete serie de 245 cavallos.