FROM THE ORTHOPAEDIC CLINIC, VÄSTERÅS, SWEDEN
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"POSTERIOR APOPHYSIS" IN L. IV—THE CAUSE OF NEURORADICULAR DISTURBANCE

By

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The so called Apophysis (intercalary bones) which is sometimes found on radiological examination and is sometimes localised to the two lowest thoracic vertebrae but usually to the anterior upper margin of the lumbar vertebrae seldom produces any subjective trouble or clinical findings. In adults it is seen on lateral X-rays as a small triangle, displaced rather forward and upward from the upper edge of the vertebral body without osseous connection with the vertebra, which is somewhat blunted on its upper edge (Fig. 1). Earlier it was considered that a non-uniting vertebral epiphysis was involved, that is, a persistent epiphysis; later one liked to explain the phenomenon as an avulsion of the anterior part of the vertebra (therefore it was called in German literature "Abscherungen oder Abtrennungen von Wirbelkörperkanten" i.e., "Avulsions or Separations from the borders of vertebrae").

In 1928 *Schmorl* described and discussed in closer detail the above conditions. He introduced the designation apophysis instead of epiphysis in order to emphasise that this annular cartilage had nothing to do with the growth of the actual vertebral body. In German literature the apophysis was called "Randleiste". Corresponding with the German "Randleiste" *Hellmer* (1932) invented the term "limbus vertebrae" to designate the apophysis. According to *Hansson* (1926) the apophysis as a rule in girls ossifies at the ages of 11-13 and in boys from 12-15 years but a complete ossification may sometimes be delayed up to 20 to 25 years of age.

That a fracture of the upper edge of the vertebra and apophysis are two separate things was pointed out early by *Dyes* (1933), an opinion which nowadays clinicians, radiologists and pathologists hold in full

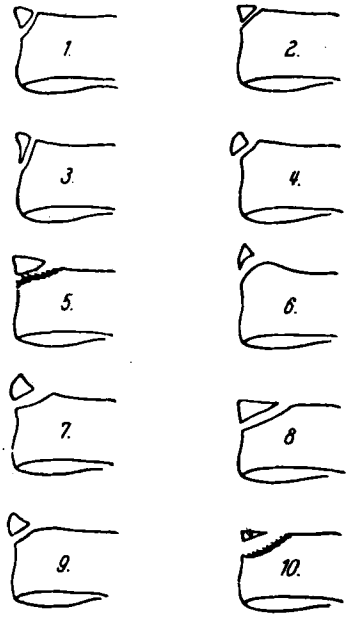

Fig. 1.
Various forms of anterior apophysis according to *W. Leger* (1955).

agreement. *Schmorl* (1928), *Junghanns* (1930), *Nieder* (1932), *Hellstadius* (1947-48), *Lindblom* (1951), *Leger* (1955) explain the arisal of anterior apophysis as owing to an impression by intervertebral disc tissue in the cancellous bone of the vertebra, which slowly passes to the border of the vertebra and finally brings about an "Abscherung". Another opinion concerning the etiology of apophysis was put forward by *Hansson* (1926), *Joisten* (1930), *Hellmer* (1932) and partially by *Mardersteig* (1932), who thought that an ossification disturbance between the apophysis and the vertebra was involved. This opinion receives a certain support from anatomic-histological research by *Töndury* (1958) and *Schajowicz* (see *Töndury*).

The majority of apophysis are localised to the upper anterior vertebral border and occur mostly in one vertebra, but reported cases exist, where they occur in several adjacent vertebrae and also in the lower anterior border of the vertebral body.

"The posterior apophysis" seems to be very rare and the first case of posterior apophysis, i.e., from the posterior, lower border of L. IV, was described by *H. von Meyenburg* in 1946. *Lindblom* (1951) published two cases, one radiological and one pathologic-anatomical, with-

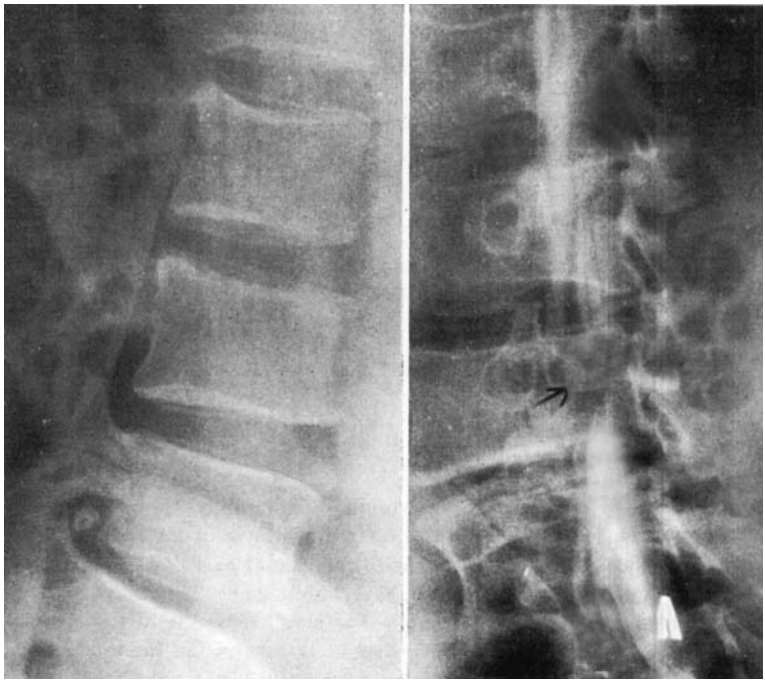

Fig. 2a.
Case no. 1. Left: posterior L.IV apophysis on lateral X-ray.
Right: corresponding myelography.

out stating from which vertebrae the apophysis came. In our clinic within the course of one year no less than 3 cases of "posterior apophysis" were observed, all issuing from the lower posterior part of the L. IV vertebra. All three patients came to us for lumbago-ischias trouble and the X-rays showed a dislocated fragment from the posterior lower part of the L. IV vertebra.

These three cases are presented briefly below.

Case no. 1: J. no. 1068/60. A man aged 42, he had a short period of insignificant aching in his back and right calf in 1958. He denied any back trauma. On 16.9.60 sudden aching occured in the left calf muscles but disappeared after some hours. Instead almost total paresis arose in dorsal extensors of the left foot. No back pain. On admittance to the Orthopaedic Clinic 27.9.60 there had again been aching in the left leg for some days. There was almost total paresis in the dorsal extensors of the left foot. Patellar and Achilles reflexes were normal. Lasègue pos. on the left side was 90°, on the right 75° (crossed). X-rays showed quite pronounced disc degeneration L.IV–L.V and also behind the posterior lower corner of L.IV vertebra was an ossified body, about 7 mm. high and 5 mm. thick. It seemed to be avulsed from the

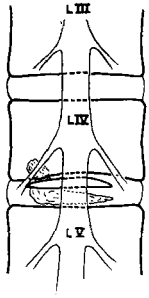

Fig. 2b.
Case no. 1. Diagram: position of the apophysis, of the L.V. nerve root and of the disc rupture at operation.

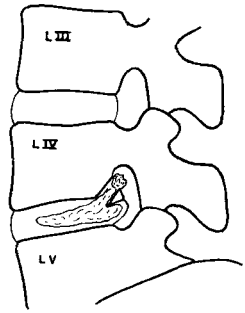

Fig. 2c.
Case no. 1. Diagram: tipped apophysis and disc rupture.

posterior lower border of the L.IV vertebra. Tomography showed no destruction within L.IV. The bony body behind the vertebra's posterior-lower border was a few cms. wide from side to side. On a level with the caudal part of L.IV vertebra myelography revealed a marked bulge in the subarachnoid space. This bulge was strikingly long and extended from the middle of L.IV vertebra across the intervertebral disc to the upper part of L.V vertebra. In the centre of this bulge lay the ossified body described above. L.V's nerve root was displaced medially backward (Fig. 2a). Owing to the severe aching of the left leg and the marked paresis of the dorsal extensors of the large toe and foot, operation was performed on 3.10.60 with hemilaminectomy on L.IV on the left side. The L.V root was found severely compressed and adhering to its surroundings. A pronounced protusion of the disc lying below was found. The disc was incised and large masses of degenerated disc tissue, in all, 4 ccs, were taken out. After the disc was evacuated, it was also observed that the nerve root was pressed laterally by quite a hard tissue which on closer inspection proved to consist of the "avulsed piece of bone" observed on X-ray. The whole of the posterior lower corner of the L.IV vertebra was dislocated backward but its cranial part was firmly attached to the remainder of the vertebra with a connective tissue similar to pseudarthrosis or an epiphyseal line. The L.V root was brought round medially and a large free-lying disc sequestrum which measured 1.5 cms. was discovered (Fig. 2b). This sequestrum had moved from the disc between the dislocated vertebral border and the vertebra itself in a direction from below and upward (Fig. 2c). During its passage the disc sequestrum had lifted up "the posterior apophysis" so that the L.V root had jammed between the avulsed piece of bone which lay medially-caudally and the disc sequestrum which lay ventrally-cranially and laterally. The dislocated piece of bone was successfully removed: in certain places, however, it was very firmly attached to the vertebra and connected to it by fibrous tissue, similar to pseudarthrosis tissue. The dislocated piece of bone made a marked transverse impression on the dura. PAD of the dislocated bone showed lamellar bone, proliferative hyaline cartilage tissue and periosteal connective tissue. The preparation was quite free from signs of inflammation. The post-operative course was without complication. The patient had no more aching in the left leg. The paresis slowly

receded. He was discharged on 15.3.61 and on reexamination the 16.3.62 he had no trouble from back or leg, Lasègue was neg. bilaterally, but there was slight paresis in dorsal extensors of the left foot. After discharge the patient had worked on heavy line work to the fullest capacity.

Case no. 2: J. no. 182/61. A man aged 19. Previously healthy. He had done heavy agricultural work. He had never had back trouble and denied firmly any back trauma. He came on the 13.2.51 because of persistent aching on the exterior aspect of the whole of the left leg. The trouble was 2 weeks old with successively increasing pain. On clinical examination there was severely restricted forward bending, throbbing pain above the lumbar back. Lasègue pos. on the left side was 30°, crossed pos. on right side was 60°. Achilles reflexes were absent on the left side. Otherwise neurologically O. Radiological examination including tomography and myelography showed a large defect on the posterior lower part of L.IV and behind this defect a large fragment dislocated from the vertebra about 10 mm. high and 5 mm. thick. The dislocation was estimated at fully 1 cm. backward. The dislocated posterior border of the vertebra made a bulge into the subdural space the size of a grape (Figs. 3a, 3b). Owing to the marked lumbago-ischias trouble of the patient and the X-ray findings he was operated on the 22.2.61 with total laminectomy on L.IV. On operation a considerable bulge was found cranially to the exit of the S.I root on the left side; this bulge passed like a rampart beneath the dura towards the right

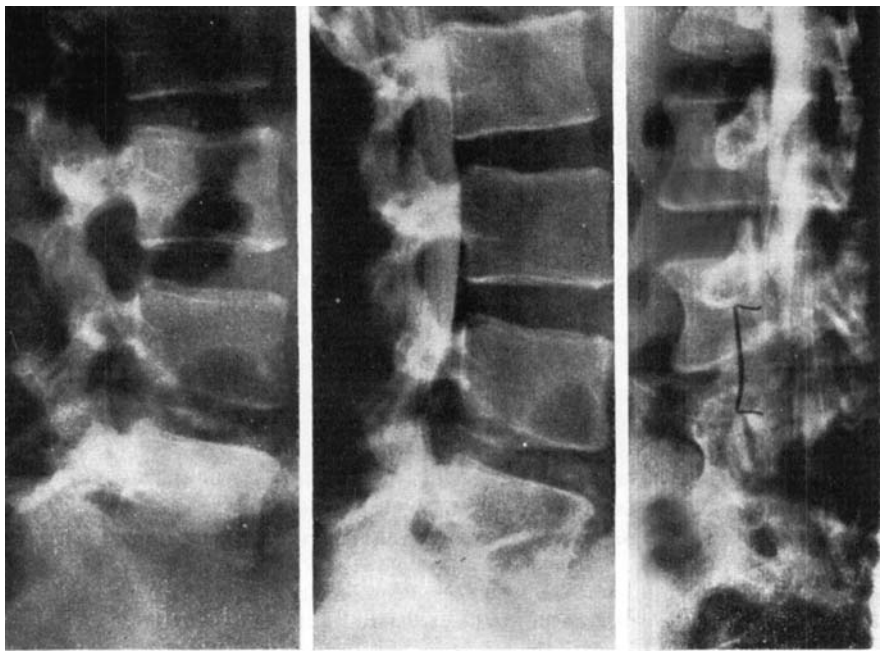

Fig. 3a.
Case no. 2. Localisation of posterior L.IV, X-ray and myelography.

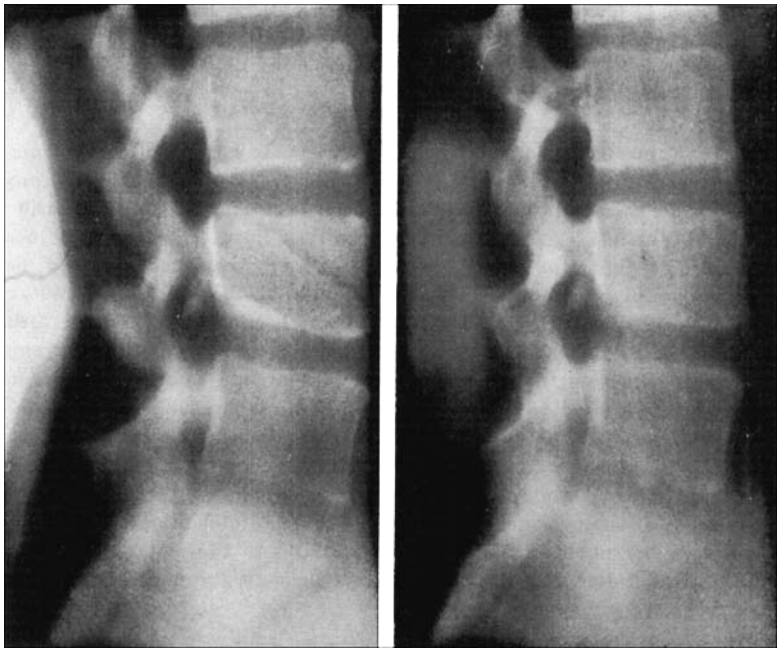

Fig. 3b.
Case no. 2. Tomographic picture of the apophysis.

side (Fig. 3c). This corresponded very well with the X-ray finding of the posterior apophysis, localised to lower posterior part of L.IV. On the left side caudally of the apophysis a distinct disc rupture was palpated which extended medially in under the dura. Neither the disc rupture nor the lateral end of the apophysis reached the L.V root, which looked quite normal macroscopically. The disc was incised and fully 1 cc. of degenerated disc tissue was taken from it. On the right side of the dura the disc also bulged somewhat but not so much as on the left; the disc was incised here too and fully ½ cc. of degenerated tissue was removed. The posterior apophysis was dissected free. Its lower end was tipped backward while its upper end was firmly attached to the rest of L.IV vertebra by a tough connective tissue (Fig. 3d). This connective tissue extended across the whole width of the apophysis. Macroscopically it looked like an epiphyseal line.

Since the apophysis was very large and firmly attached to the vertebra, total removal was rejected. Instead only the posterior part which pressed against the dura throughout its width was exstirpated. After this intervention no more pressure was present against the dura. The postoperative course was completely free from complication. The aching in the left leg disappeared completely. The patient was discharged 16.4.61. The last follow-up was on the 3.8.61. There was no ache, the status of the back was completely normal. Lasègue was neg. Only slight reduction of the Achilles reflexe on the left side. The patient had been employed the whole summer on heavy agricultural work.

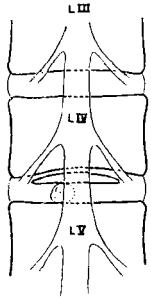

Fig. 3c.
Case no. 2. Diagram: position of apophysis and disc rupture at operation.

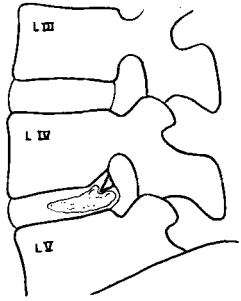

Fig. 3d.
Case no. 2. Diagram: tipped apophysis and disc rupture.

Case no. 3: J. no. 854/61. A woman 22 years of age. Previously healthy. She denied back trauma. She had suffered back trouble for 2 years in the form of tiredness and aching in the lumbar back sometimes radiating towards the right hip and right leg on the posterior aspect of the thigh and on the same aspect of the calf towards the right heel. In the summer of 1961 there was considerable worsening when she helped her husband to build a summer cottage. She went to the local doctor who made the diagnosis of lumbago-ischias and remitted the patient to the Orthopaedic Clinic.

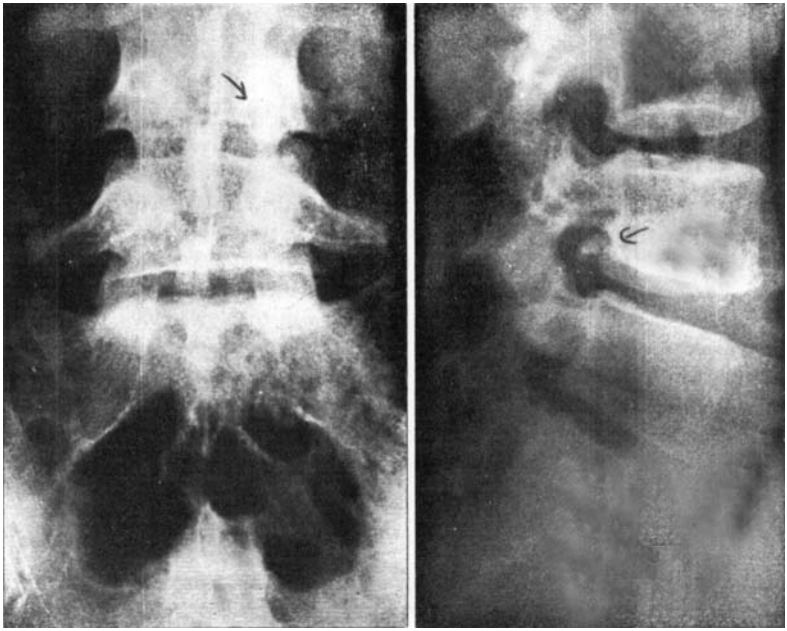

Fig. 4a.
Case no. 3. Radiology: localisation of posterior apophysis.

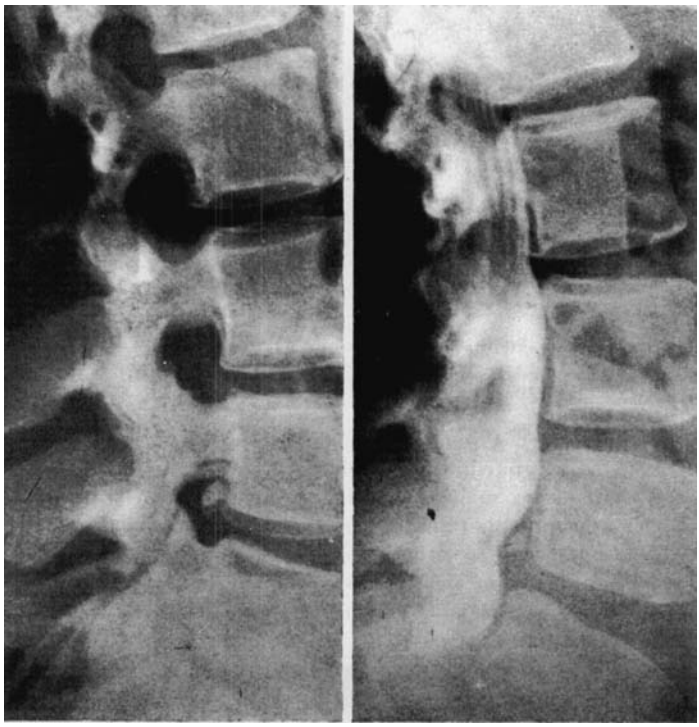

Fig. 4b.
Case no. 3. Radiology with myelography, lateral picture with localisation of apophysis.

On examination at the beginning of August, 1961, the status was completely negative, but X-rays showed on the right behind the posterior lower vertebral border of L.IV "a calcification the size of a peanut" and of the same appearance as the "Posterior apophysis" described above. (Fig. 4a). The intervertebral spaces were normal. Apart from the previously described posterior apophysis in the lower part of L.IV, myelography showed a moderate bulge in the contrast medium on a level with the intervertebral disc L.IV–L.V. The bulge was especially pronounced on the lateral picture but not on the frontal picture. (Fig. 4b). There were no certain signs of disc rupture. Since the patient had no signs of root compression on examination and was completely free from trouble, no indication for operation was found.

CONCLUSIONS

In all these cases the diagnosis of posterior apophysis from L. IV appears to be completely certain. The possibility that instead a pseudarthrosis might be involved can be rejected since:

1) isolated fresh fractures of this type are unknown and as far as

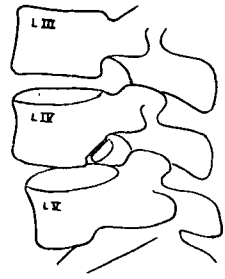

Fig. 5.
Diagram of posterior apophysis of L.IV vertebra.

one can understand, impossible without simultaneous injury to arches or intervertebral joints.

2) these three cases radiologically and anatomically are fully similar to those quite common anterior apophysis which are not now considered to be traumatically conditioned.

3) in spite of a particularly thorough questioning of the patients it was not possible in any single one of these cases to discover any adequate trauma.

Whether it is an ossification disturbance or, like *Schmorl's* nodules, a dissecting disc mass, detaching the posterior corner of L. IV, or whether both factors contribute to the arisal of the posterior apophysis is difficult to judge. The level and straight connections, similar to epiphyseal lines, which were observed at the 2 above operations between the vertebra and the cranial part of the apophysis (Fig. 5) and also the pathological anatomical examination of the operative preparation in the first case argue in my opinion in favour of ossification disturbance.

As I understand it, the incompletely ossified area formed a corpus minoris resistentiae and an impression by degenerated intervertebral disc tissue in this area brought about an avulsion of the apophysis and produced neuroradicular symptoms.

SUMMARY

The author describes three cases of posterior apophysis, originating in the posterior lower part of the L. IV vertebra.

In the first case the apophysis caused an L. V. syndrome, in the second case an S. I' syndrome and in the third case a history of lumbago-ischias trouble but without clinical findings on examination.

At operation disc rupture was encountered both in the first and in the second operation case.[1]

RESUME

L'auteur décrit trois cas d'apophysite postérieure provenant de la partie inférieure de la 4ème vertèbre lombaire.

Dans le premier cas, l'apophysite a provoqué un syndrome de la 5ème vertèbre lombaire. Dans le deuxième, un syndrome de la 1ère vertèbre sacrée et dans le troisième cas des troubles anamnestiques de lumbago-sciatique, mais sans trouvailles cliniques à l'examen du cas.

A l'opération, on a trouve une rupture du disque aussi bien dans le 1er que dans le 2ème cas.

ZUSAMMENFASSUNG

Der Verfasser beschreibt drei Fälle von rückwärtiger Apophysitis, die sich vom hinteren, kaudalen Teil des 4. Lendenwirbels entwickelte.

Im ersten Falle rief die Apophysitis ein L:V Syndrom hervor, im zweiten Falle ein S:I Syndrom und im dritten anamnestisch Lumbago-Ischiasbeschwerden, jedoch ohne klinischen Befund anlässlich der Untersuchung. Bei der Operation wurde ein Zwischenwirbelscheibenbruch im ersten und zweiten Falle gefunden.

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[1] Since the above article was completed, another case of posterior L.IV apophysis has been observed at the Clinic here. It is reported briefly below.

A previously healthy schoolboy, aged 14. He has had increasing trouble in the last 2 years in the form of tiredness and sometimes aching in the lumbar back after athletics or fairly heavy lifting. No case history of back trauma. The aching does not radiate towards the lower extremities. The back has increased its aching in recent months. He came to the Clinic for back trouble. Clinically the status is completely normal.

Radiology shows slight Morbus Scheuermann, a low disc between L.IV–L.V, and also an apophysis from the posterior lower part of L.IV. On X-rays the above apophysis was measured at about 3 mm. high and 6 mm. thick. It extends about 6 mm. into the spinal canal calculated from a plane through the posterior border of the vertebral body. The case is under observation and no orthopaedic measures have yet been undertaken.

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