

From the General Hospital, Björneborg, Finland.

## “THE PLANTA PEDIS SYMPTOM”—A NEW SYMPTOM OF COMPRESSION OF THE NERVE ROOT LV OR SI

*By*

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During an attack of left-sided sciatica with a typical SI syndrome, I noticed in myself a symptom which I have not seen described in the literature (1-3). When I stepped on my left foot it felt as if, under the capitulum mtII or mtIII, there was a nail or a small stone in my shoe. This symptom disappeared, along with the other symptoms of root compression, as a result of complete bed rest. It left no permanent change. Because of this observation, I have since looked for a similar symptom in my patients and noted its relation to other symptoms and to operative findings. In the following I shall relate my observations and try to explain the mechanism of origin of this symptom. I have called the symptom and its variations “the planta pedis symptom”.

### MATERIAL

The planta pedis symptom was found in 13 patients with the sciatic syndrome, in 10 cases on the left and 3 on the right side. 8 of the patients were men with an average age of 41 years and 5 women with an average age of 43 years.

### PAST HISTORY

11 patients had complained of sacral symptoms. 7 patients had had at least one previous attack of sciatica on the same side, one had had sciatica on the contralateral side and one had had a bilaterally positive Lasègue sign but no symptoms of prolapse.

### SYMPTOMS

There had been acute onset of pain in 4 cases (in 2 cases when the patient bent forward to tie his shoe-laces); in the remaining cases the onset had been gradual.

The predominating symptom was radiating pain in the leg in 12 cases and in 1 case a sensation of numbness in the leg.

Other subjective symptoms were: Pain in the leg on coughing and sneezing: 5 cases, the same in the back: 1 case. Numbness: 2 cases. Pricking "as by ants" in the contralateral foot: 1 case. "Trembling" in the muscles of the calf of the leg: 1 case.

#### OBJECTIVE SYMPTOMS

Positive Lasègue sign: 11 cases (in 4 cases at 30 to 35°, in 3 at 40 to 45°, in 2 at 50 to 55°, in 2 at 70 to 75°).

Crossed Lasègue: 5 cases. (In one patient both the Lasègue sign and the crossed Lasègue had become negative before the onset of the planta pedis symptom.)

Weak patellar reflex: 1 case (this patient had been confined to bed for two months before visiting a doctor and he had severe atrophy of the muscles of the entire leg).

Weakened extension of the great toe: 7 cases, 3 of which were mild.

Weakened Achilles tendon reflex: 10 cases (the reflex was absent in 5 cases). In addition the Achilles tendon reflex was weakened on the contralateral side in 1 case.

Reduced sensibility within the LV dermatome: certain in one and uncertain in 3 cases.

Reduced sensibility within the SI dermatome: certain in 6 and uncertain in 2 cases.

Reduction of the sensibility in a wedge-shaped area from the middle of the instep to the plantar side of the second to the fourth toe: 2 cases.

Reduced tonus in the gluteal muscles (2): 3 cases.

Fallen transverse arch: 1 case.

#### CLINICAL DIAGNOSIS

On the basis of the subjective and objective symptoms the following diagnoses were made:

1. Compression of the LV root: 1 case.
2. Compression of the LV and SI roots: 6 cases (in 2 cases compression of the root LV was considered predominant, in 4 cases compression of the SI root).
3. Compression of the SI root: 5 cases.

4. Sciatica with no indication as to the compressed root: 1 case, with acute onset, which had been examined once only when no certain symptoms of prolapse could be detected.

The diagnosis was verified by myelography and subsequent operation in 2 and by operation alone in 5 cases. Because the prolapse symptoms from the SI root predominated, the disc LV/SI in one case was first explored but the prolapse was situated at the LIV/LV level. In those cases in which operation was not considered to be indicated, myelography was not carried out.

In 3 of the operated cases a prolapse of the LV/SI disc compressed the root SI. In 3 cases a medial prolapse of the disc LIV/LV compressed the root LV and might also have irritated the root SI. In 1 case the LV root was compressed by a prolapse of the disc LIV/LV situated laterally to the root. It is thus evident that the *planta pedis* symptom may occur in both isolated compression of either the LV or the SI root and in simultaneous compression of both roots.

The *planta pedis* symptom did not occur (or was not observed?) until after the operation in 2 cases, whilst in 2 other cases the symptom was aggravated during the postoperative stage. The probable reason for this is that during the operation the root was subject to pressure or stretching but the possibility of a prolapse at another level than that removed at operation, whether subsequently occurring or overlooked during the operation, cannot be excluded. I shall briefly relate these cases:

1. (P, R.A-L, Björneborg General Hospital 5394/62): LV + SI syndrome with weakened extension of the great toe and Achilles tendon reflex and pain radiating to the lateral side of the calf of the leg. Pressure on the intervertebral space LIV-LV during operation produced radiating pain at the same site. In this space there was a large, medially situated prolapse. Postoperatively the area under the capitulum mtII-III felt "thick". Pain was sometimes felt in this area. Four months after the operation the Achilles tendon reflex was negative; otherwise the status was normal.

2. (v.T.,J., Orthopaedic Hospital of the Invalid Foundation 22440/64): SI syndrome with absent Achilles tendon reflex. Myelography: "Somewhat uncertain: prolapse to the left at the LV/SI level". Operative finding: The SI root was adherent to a low "dried up" prolapse of the disc LV/SI and the lower edge of the vertebra LV was prominent. Postoperatively, there was a slightly weakened extension of the left great toe, the sensibility under the arch and the capituli mtII-III was reduced, "it feels like stepping on something soft".

3. (J.,H. Björneborg General Hospital 5373/63): LV + SI syndrome with reduced extension of the great toe and weakened Achilles tendon reflex. Reduced sensibility in the three lateral toes. Medially of the root LV in the space LIV/LV a rather large prolapse was found. Postoperatively the pain disappeared but the foot felt weak and

the patient reported that it felt "like stepping on a stone under the capitulum mtII-III" and remembered that he had had the same feeling earlier, although less pronounced. When tip-toeing the patient showed a tendency to varus position in the ankle, there was reduced sensibility in the LV and SI dermatomes. Otherwise the condition was as before.

4. (K., J., Björneborg General Hospital 5036/64): SI syndrome with weakened Achilles tendon reflex and reduction of the sensibility within the SI dermatome. At operation the LV/SI space was explored and found intact, the SI root being insensitive to pressure. Pressure on the root LV produced pain within the same area as the spontaneous pain. Medially of the root a large prolapse of the disc LIV/LV was found. Postoperatively the pain disappeared, the foot felt somewhat weak, and there was a tendency to sprain in a varus direction. The patient remembered that since his first attack of sciatica 12 years earlier he had had a hard corn under the capitulum mtIII. It became tender after the operation and he noticed increased sensibility under the foot. The Achilles tendon reflex was weakened, the extension of the great toe was insignificantly weakened and there was reduced sensibility within the SI dermatome.

*The planta pedis symptom* is composed of a reduction of the sensibility and a pain component. These may occur together or separately. It was described by 13 patients as

1. Pain under the capitulum mtII-III: 9 cases. In 7 of these, pain was the predominating symptom. In 3 cases compression of LV and in 1 case of SI was operatively demonstrated and in the other cases a clinical diagnosis of compression of LV was made in 1 case, of (LV?) + SI in 1 case, of SI in 2 cases (and in 1 case uncertain root compression).

2. "Fullness", "a cushion", or "a fold in the stocking" under the capitulum mtII-III: 5 cases.

In one of these cases compression of LV was operatively demonstrated, whilst in the other cases compression of LV + SI was clinically diagnosed in two cases and compression of SI in one case.

3. Loss of feeling under the middle of the anterior part of the arch of the foot: 4 cases. In 2 of these, compression of SI was operatively verified, while in 2 cases the same diagnosis was made clinically.

4. A feeling as if "a thread had been tightened around the second and third toes": 1 case. The clinical diagnosis in this case was compression of SI.

## DISCUSSION

The variations of the *planta pedis* symptom are probably a result of functional disturbance of nerve fibres from the roots of LV and SI passing through the medial and lateral plantar nerves. The lack of

sensibility is an expression of disturbed sensory function. The feeling of "fullness" is probably also a result of the sensory disturbance, possibly combined with an increased stress on the capituli mtII-III. This increased stress must be the cause of the pain component and is itself the result of the falling of the transverse arch. The falling of the arch is a consequence of the weakening of the adductor hallucis muscle which runs transversely under the metatarsal bones and which is innervated by the segments SI-SII. The stress on the capituli mtII-III is probably further increased if the toes, owing to weakened flexion in the metatarsophalangeal joint, cannot take over some of the weight-bearing. This happens if there is weakening of the interosseal muscles, innervated from the segments SI-SII, which, acting in concert, produce plantar flexion of the phalanges in question and extend the interphalangeal joints. The strength of the plantar flexion of the toes, however, depends on the long and short flexors of the toes, which are innervated from the segments LV-SI. A weakening of the plantar flexion of the first metatarsal bone (when the *musculus fibularis longus* innervated from the segments LV-SI is weakened) adds further to the stress on mt II and III.

It is thus possible to trace the principal components of the *planta pedis* symptom to a disturbance of the function of the roots LV and SI, a conclusion which is in agreement with the other clinical symptoms and with the operative findings in the operatively treated cases.

The symptom is not a common one and since it may evidently occur as a result of compression of two different roots, LV and SI, it is of little significance as an aid to diagnosing the level of the lesion. It is, however, an additional factor in the symptomatology of root compression.

#### S U M M A R Y

A new symptom, called "the *planta pedis* symptom", was observed in 13 patients with the sciatic syndrome. On the basis of the subjective symptoms and objective signs a diagnosis of compression of the LV or the SI root (or both) was made, and in 7 patients the diagnosis was verified by operative findings. The symptom is composed of pain under the 2nd and 3rd metatarsal heads and (or) reduction of the sensibility with "fullness" of the corresponding plantar area.

The pain component is probably the result of the falling of the transverse arch caused by the weakening of the adductor hallucis muscle. This muscle is innervated by the segments SI and SII. The plantar

surface under the metatarsal heads is innervated with sensory fibers from the segments LV and SI. It is thus possible to trace the planta pedis symptom to a disturbance of the function of the roots LV and SI.

# RESUME

Un nouveau symptôme appelé « le symptôme planta pedis » a été observé chez 13 malades avec syndrome sciatique. Sur la base des symptômes subjectifs et des signes objectifs, un diagnostic de compression de la racine de la 5ème vertèbre lombaire ou de la 1ère vertèbre sacrée (ou les deux) a été posé. Chez 7 malades, le diagnostic a été vérifié par les trouvailles opératoires. Le symptôme se compose de douleurs sous l'extrémité renflée des 2ème et 3ème métatarsiens et (ou) d'une réduction de la sensibilité de la surface plantaire correspondante.

Le composant de la douleur est probablement le résultat de l'affaissement de l'arc transversal causé par l'affaiblissement du muscle adducteur hallucis. Ce muscle est innervé par les segments sacrés I et II. La surface plantaire sous les métatarsiens est innervée par des fibres sensorielles des segments lombaire V et sacré I. Il est donc possible de trouver la trace du symptôme planta pedis à un trouble de la fonction des racines LV et SI.

# ZUSAMMENFASSUNG

Ein neues Symptom, „das planta pedis Symptom“ genannt, wurde bei 13 Patienten mit Ischiassyndrom beobachtet. Auf Grund der subjektiven Symptome und der objektiven Zeichen wurde die Diagnose einer Kompression der L5 oder S1 Wurzel (oder beider) gemacht und bei 7 Patienten wurde die Diagnose durch den operativen Befund bestätigt. Das Symptom besteht in Schmerzen unter dem zweiten und dritten Metatarsalköpfchen und (oder) Herabsetzung der Sensibilität mit „Völlegefühl“ der entsprechenden plantaren Fläche.

Die Schmerzkomponente ist wahrscheinlich auf das Herabsinken des Quergewölbes, das infolge der Schwächung des m. adductor hallucis entsteht, zurückzuführen. Dieser Muskel wird von den Segmenten S1 und S2 innerviert. Die plantare Oberfläche unter den Mittelfussköpfchen wird mit sensiblen Fasern von den Segmenten L5 und S1 innerviert. Es ist daher möglich das planta pedic symptom auf eine Störung der Funktion der Wurzeln L5 und S1 zurückzuführen.

## REFERENCES

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