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Peroneal Nerve Palsy due to Fabella

Kyoichi Takebe and Kazushi Hirohata

Department of Orthopaedic Surgery, Kobe University School of Medicine, 7-chome, Kusunoki-cho, Chuo-ku, Kobe, 650, Japan

Summary. In general, the fabella has been considered to have a minor clinical significance, and has not been recognized as one of the causes of peroneal nerve palsy. Seven cases of peroneal nerve palsy due to the fabella are reported. The typical clinical features and the importance of electrophysiological examinations in making an accurate diagnosis are described. Of the seven cases mentioned above, three cases were treated by surgery and four cases by conservative methods.

Zusammenfassung. Im allgemeinen wurde der Fabella klinisch wenig Beachtung geschenkt, da nicht erkannt wurde, daß sie auch Peroneuslähmung verursachen kann. Hier wird von 7 Fällen von Peroneuslähmung, verursacht durch die Fabella mit ihrem typisch klinischen Bild, berichtet, und die Wichtigkeit der elektrophysiologischen Untersuchung zur genauen Diagnosestellung besonders hervorgehoben. Drei Fälle wurden operativ und 4 Fälle mit konservativen Maßnahmen behandelt.

Although the various causes of peroneal nerve palsy have been reported, the fabella has not been fully recognized as a causative factor.

Based on 7 cases of peroneal nerve palsy due to the fabella, the clinical features, electrodiagnosis and treatment of this condition are presented and discussed in this paper.

Table 1. Clinical data on each patient studied

Case	Age	Sex	Onset	Muscle power	Tendernes on fabella	Radiating pain	Size of fabella (mm)	Treatment
1	49	Male	Putting on the pants?	TA 4[a] EHL 4[b]	+	+	9× 7×6	Removal of fabella Neurolysis
2	34	Male	Playing volley ball	TA 3+ EHL 3+	+	+	11× 9×7	Removal of fabella Neurolysis
3	36	Male	Not clear	TA 3– EHL 3	+	–	10× 10×8	Removal of fabella Neurolysis
4	53	Male	Squatting	TA 3+ EHL 4	+	–	11× 11×8	Conservative
5	40	Male	Not clear	TA 3 EHL 3+	+	+	8× 8×6	Conservative
6	22	Male	Playing table tennis	TA 2 EHL 3	+	–	9× 9×7	Conservative
7	25	Male	Crossing the legs	TA 4– EHL 4	+	–	7× 5×4	Conservative

[a] Tibialis anterior muscle
[b] Extensor hallucis longus muscle

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Material

Seven cases of peroneal nerve palsy caused by compression from the fabella were treated and evaluated at Kobe University Hospital during a period of 3 years from 1976 through 1979.

All the patients were males. The period of follow-up ranged from five to thirty months (20 months on the average). Five had involvement of the left side and two had it on the right side. Three patients underwent surgery (Table 1) and the rest were treated conservatively.

Results

Clinical Symptoms

Limited ankle dorsiflexion and estension of the toes, with foot drop and steppage gait are the prominent features of this condition. Usually, the onset is conspicuous which is characterized by abrupt weakness of the muscles innervated by the peroneal nerve. Such a symptom occurs frequently when the knee is suddenly flexed and occasionally when the popliteal space is compressed for a long time. There are instances however when paralysis develops gradually, making it difficult to recognize clearly the time of onset and the beginning of the palsy.

All cases manifested varying degrees of sensory disturbance along the antero-lateral aspect of the leg and the foot, in addition to a foot drop.

The most characteristic finding is tenderness, which is elicited by compressing the fabella in the popliteal space. Radiating pain to the leg and the foot along the course of the peroneal nerve was observed in half of the cases. Pain is sometimes felt within or outside the popliteal area when hyperextending the knee joint. Since the fabella is usually present bilaterally, tenderness and radiating pain can be more accurately evaluated by comparing both extremities during physical examination. Variations in clinical manifestations include aggravation of the subjective complaints by climbing up and down the stairs and symptoms of sciatic nerve stimulation. Muscle atrophy in the leg is insignificant in the early stage but becomes noticeable if the symptoms continue for a longer period.

Electrophysiological Examinations

Full consideration of these clinical symptoms may lead only to a clinical impression, but in order to obtain a conclusive diagnosis, electromyography and measurement of the nerve conduction velocity are useful. In this study, these examinations were performed on all the cases, and the results are shown in Table 2. All the patients were subjected to these tests at least 3 weeks or more after the onset. EMG tracings taken at rest showed a positive sharp wave and fibrillation. A decline in the insertion voltage and in the number of discharges was also noted, even in those cases where an abnormal wave was observed at rest. The other cases showed a polyphasic pattern. A diagnosis of peroneal nerve palsy can be given based on the findings described above. To detect the etiological site, measurement of the nerve conduction velocity in a narrow area surrounding the fabella in the popliteal space is useful. As shown in Table 2, almost all of the cases showed a slower

Table 2. Electrophysiological examinations

Case	EMG findings			Nerve conduction velocity (m/s)	
	At rest		Contraction	NCV between the popliteal space	NCV between knee and ankle
1	TA[a] PL[b]	Fib+[c]	Reduced motor unit +++ Low voltage	31	44
2	TA PL	Fib+ Psw+[d] Fib+	Reduced motor unit +++ Polyphasic	38	50
3	TA) PL)	Fib+ Psw+	Reduced motor unit +++ Polyphasic	30	49
4	TA PL	— —	Reduced motor unit + 0.8 ~ 1.0 mv	50	55
5	TA PL	— Fib+ Psw+	Reduced motor unit +++ 0.8 ~ 1.0 mv	40	49
6	TA PL	— —	Reduced motor unit ++ 0.1 ~ 0.2 mv	30	56
7	TA PL	Fib+ —	Within normal limit	27	48

[a] Tibialis anterior muscle
[b] Peroneus longus muscle
[c] Fibrillation
[d] Positive sharp wave

peroneal nerve conduction velocity in the popliteal space as compared to the distal portions of the extremity. This is an important diagnostic point suggesting pressure to the nerve around the area of the fabella. In Case 4, the conduction velocity in the popliteal space was within the normal range, whereas the irritability was obviously lower at the area proximal to the fabella.

In almost all cases, electromyographic findings and values of the nerve conduction velocity returned to the normal range after treatment.

Treatment

Cases 1 to 3 were subjected to surgical operation, and cases 4 to 7 to conservative treatment. All recovered satisfactorily. The operation was performed more than 1.5 months after the onset. Case 1 was complicated with lumbar disc herniation, and this explains why foot drop and sensory disturbance in the leg were incorrectly considered to have originated from the lumbar region, resulting to a delay in diagnosis. Inspite of an operation which was performed 8 months after the onset, a slight functional disturbance persisted. Case 2 and Case 3 were subjected to operations 2 months and 1 month respectively after the onset and the patients recovered completely.

Patients recovered dramatically after surgery and some of them regained their sensory function even on the first postoperative day. The remaining cases took at least a week for the hypesthesia to revert to normal. Simultaneously or a little later, ankle dorsiflexion steadily became stronger, followed by improvement in extension of the toes. This pattern of recovery was noted from the surgically treated patients.

The cases subjected to conservative treatment were all diagnosed in the early stage after initial consultation, and all improved. Case 5 was subjected to the conservative treatment and recovered completely after 1 month. However, about 2 years after recovery, the patient started complaining of slight numbness in the back of the foot for about a month, with mild symptoms of peroneal nerve stimulation treated.

Among the cases treated conservatively, foot drop began to improve 3 or 4 days after the treatment. Some patients recovered completely within 2 or 3 weeks, although most of cases required 1 to 2 months for recovery.

Case Reports

Case 2: T.N., 34 years old. This patient suddenly felt pains in the low back and the left leg when he crouched while playing volley ball. Unable to walk, he sought consultation from a doctor and the medications taken relieved the lumbar pain. However, the weakness in his left leg persisted which prompted him to visit our hospital. The Laséque test was positive at 80°. There was sensory disturbance along the antero-lateral aspect of the leg and the foot with weakness of the tibialis anterior and the ext. hall. long. muscles. Myelography revealed a slight compression of the L_5 nerve root. Lumbar disc herniation was suspected but since the myelographic findings were not clear and the muscle weakness was significant (tibialis anterior muscle, 3), an electrophysiological examination was performed.

The nerve conduction velocity distal to the knee was 50 m/s, while the velocity in the popliteal space around the fabella was reduced to 38 m/s. Electromyogram showed signs of denervation in the tibialis anterior muscle and the peroneal muscles. The case was then diagnosed as peroneal nerve palsy due to fabella compression. Removal of the fabella and neurolysis (Fig. 1) was performed and the neurologic functions started to recover within a week.

Eventually all the symptoms of sciatica completely disappeared after 2 months. The patient remained asymptomatic up to the present, 2 years and 3 months after the operation.

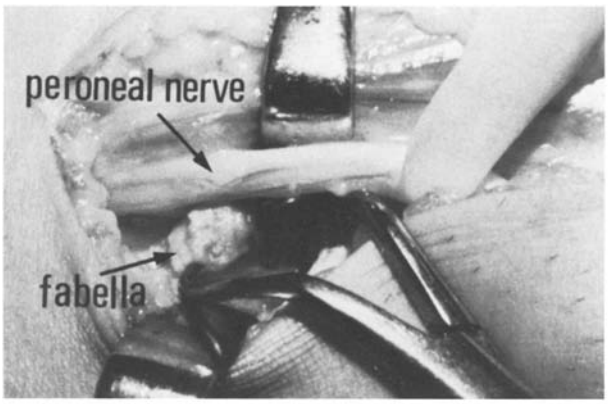

Fig. 1. The figure shows the fabella about to be detached from the lateral head of the gastrocnemius muscle, in which it was imbedded

Case 6: Y.M., 22 years old. The patient fell down while playing ping-pong, and immediately developed numbness and weakness of one leg. The patient visited our hospital on the following day with a complaint of difficulty in walking.

The limitation of ankle dorsiflexion and extension the toes were severe, and slight hypesthesia was noted along the course of the peroneal nerve. Tenderness was elicited at the fabella, and nerve conduction velocity in that part was greatly reduced to 30 m/s. The symptoms disappeared completely after about 3 weeks of conservative treatment.

Discussion

Fabella and Peroneal Nerve Paralysis

The fabella is a sesamoid bone which is usually seen in the lateral head of the gastrocnemius muscle and the incidence is about 10 to 30% [1, 3, 7]. Seventy to eighty percent of the fabella is bilateral, and the incidence is slightly higher in Orientals than in Europeans. The

Table 3. Reports on peroneal nerve palsy due to fabella

Author(s)		Number of cases	Size of fabella (mm)
1 Tajima et al.	(1963)	1	13× 10× 7
2 Yamamoto et al.	(1964)	1	Not described
3 Yamahiro et al.	(1967)	1	12× 11× 9
4 Matsuzaki et al.	(1972)	3	Not described
5 Mangieri	(1973)	1	22× 14
6 Masuda et al.	(1975)	3	10× 12× 7 6× 6× 4 15× 10× 8
7 Iida et al.	(1976)	1	12× 11× 7
8 Itoman et al.	(1976)	1	Not described

clinical significance of the fabella is usually thought to be minor, and the clinical problems about the fabella have not yet been discussed to a full extent. Tajima et al. [1] first reported on peroneal nerve palsy due to the fabella in 1963, and since then only 12 more cases were reported, as seen in Table 3 [5, 6, 8–11, 13, 14].

Considering the anatomical relationship between the peroneal nerve and the fabella, it is likely that pressure from the fabella is transmitted indirectly to the nerve, which may cause paralysis under various conditions. Factors like position and size of the fabella are important considerations. As Fischer [2] have showed, the position of the fabella is inconstant. When the fabella is located under the peroneal nerve, the resulting paralysis depends on many factors. External pressure on the politeal space, abrupt changes in the position of the leg, and prolonged compression of the leg are thought to be such factors, and paralysis is likely to be induced when the peroneal nerve is pressed between the fabella and some external factor.

The size of the fabella is considered to be another factor as shown in Mangieri's case [8]. Friedman [4] mentioned the average size of the fabella to be 7.9× 4.2 mm, and Kojima [7] stated that the size of the male fabella is 4.5× 3.5× 3 mm to 12× 9.8× 6.2 mm. Most of the values in our cases and of those reported so far are somewhat larger than the average size. This increase in size can be easily presented to be one of the causes inducing peroneal nerve palsy. However, it happens sometimes that palsy is induced by a relatively smaller fabella, and some reported that peroneal nerve palsy was induced by an enchondrous fabella. Therefore, the diagnosis based only on the presence or absence of a fabella in the X-ray picture or based on the size of a fabella must be avoided. In our cases none was a considered obese and it may be possible to say that in a thin person who has scanty subcutaneous tissue around the fabella or the peroneal nerve, may be easily predisposed to peroneal nerve compression by the fabella.

Diagnostic Problems

The main drawback to the diagnosis of peroneal nerve palsy is its clinical similarity with L5 root compression. Therefore, it can be easily mistaken for a lumbar disease. A patient with peroneal nerve palsy caused by a fabella may complain of sciatica and/or lumbar pain. The Laseque's test may even become positive. These are important clinical points that should be carefully considered. Case 1 is one of the special cases in which the peroneal palsy co-existed with lumbar disc herniation. This situation delayed the detection of peroneal nerve palsy as a second clinical entity. Cases 2 and 5 were initially diagnosed as lumbar disc herniation and were subjected to myelography.

When the diagnosis of peroneal nerve palsy is being entertained, fabellar compression should always be considered as a possible cause. Tenderness and radiating pain around the popliteal area can be elicited by palpation of the fabella. Its presence on X-ray is helpful but the final diagnosis is confirmed by E.M.G. and measurement of N.C.V. Up to this date, only 5 authors performed E.M.G. as a diagnostic procedure. Two of them did not find any abnormal finding. One author did not observe any change at rest but a complex wave in the contraction phase was found. The remaining 2 described obvious signs of denervation. Only Mangieri measured the N.C.V. and reported a reduction of velocity in the area around the fabella. The N.C.V. returned to the normal range 3 months after the operation. In this study, E.M.G. and measurement of the N.C.V. were done on all cases. The pathologic changes observed from these tests were considered very important in the evaluation of the paralysis being induced by fabellar compression. Taken altogether, signs of denervation, reduced nerve conduction velocity, and confirmed clinical symptoms will lead to a correct diagnosis.

Treatment

Previous reports advocated removal of the fabella in all cases without employing any conservative treatment. Comparing the clinical data of the operated cases to the conservatively treated cases, it was found out that there was no significant difference in the initial symptomatology between both groups. Therefore, selecting the preferred method of treatment may be equivocal. A case who had severe clinical symptoms did not show any abnormal changes in electromyogram and nerve conduction velocity. This was considered as a case of

neurapraxia and surgical intervention may not be necessary. On the contrary, cases which show obvious abnormal findings on electrophysiological examinations should be first treated conservatively. If no improvement is observed within 1 to 2 months, then removal of the fabella and neurolysis should be performed. Case 5 was cured with conservative treatment but slight numbness in the back of the foot recurred. An operation will be considered should the symptoms progress. Since this condition is caused by anatomical factors, some researchers advocate surgical treatment for all cases. However, conservative treatment was found to be effective to some patients and it is but logical to indicate surgical treatment only when conservative methods have failed.

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