

Hip Abduction Splint for Use At Night For Scissor Leg of Cerebral Palsy Patients

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One of the spastic leg positions in cerebral palsy is known as the scissor leg which is the result of continued hypertonus on the hip adduction muscles. The scissor leg is a serious disturbance for both children and parents. It contributes to disturbances in the development of physical functions such as rolling over and crawling. It can cause spastic hip dislocation or subluxation of the hip joint. Also, the compression provided by the scissor leg is a cause of torsio testis or urinary disturbance. Furthermore, it encourages the occurrence of dermatitis in the genital area.

In Tottori Kenritsu Seishi Gakuen (1751 Kamifukuhara, Yonago, Tottori, 683, Japan), thirty-seven patients (15 boys and 22 girls) between 4 and 16 years of age (average 10.9) were selected for study with the proviso that they were able to walk or stand using supporting instruments or braces. The roentgenograms of both hip joints were observed. Almost all of the center-edge (CE) angles on hip joints measured below the normal range, and 78.4 percent of them had dislocation or subluxation (Fig. 1).

For these patients, we used the hip action brace for the relaxation of hip adduction muscles during the day.

For use at night, we prescribed the conventional hip abduction brace or

the abduction board, but these devices interfered with change of position and were unclean because of nocturnal enuresia. Because the brace had many straps and parts, putting it on and taking it off were carried out with considerable difficulty.

To overcome these problems, we designed the splint shown in Figures 2 and 3 for use during the night.

Hip Abduction Splint for Use At Night

The Hip Abduction Splint for use at night has an arch-shaped pelvic band and thigh suspender made of Subortholen sheet, 3/16-inch thick. The outer side of the pelvic band is bent forward and surrounds the pelvis. A Velcro strap around the pelvis holds it in place. The thigh suspender (Fig. 4) is three-fourths of a cylinder, the opening being in the anterior-lateral section. A stainless steel turnbuckle between the thigh cuffs makes it possible to control the angle of hip abduction. Rivets are used to fasten the turnbuckle to the thigh cuff, and the thigh cuff to the pelvic band. All edges of the splint are flared toward the outside, eliminating the need for leather or sponge rubber liners. In the fabrication procedure, we measured only the circumference at the iliac crest and the thigh for each child on the drawing paper and,

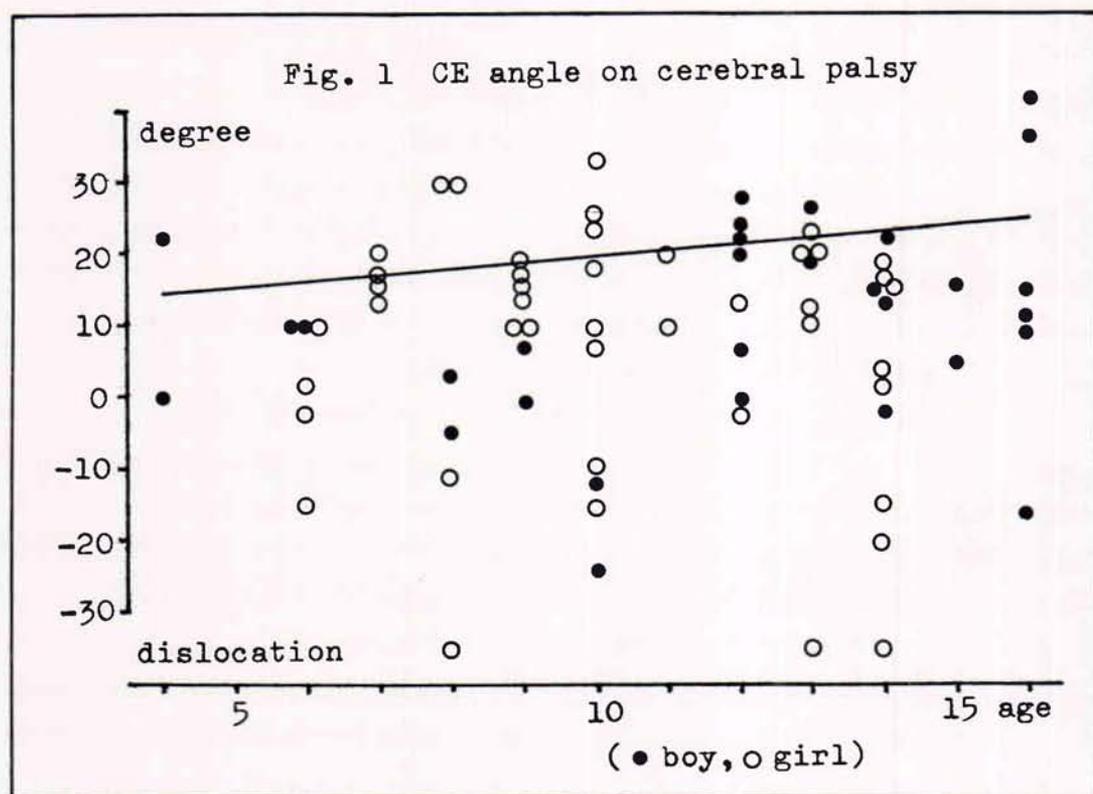


Fig. 1. Center-edge (CE) angle of cerebral palsy patients.



Fig. 2. Anterior view of Hip Abduction Splint for use at Night.

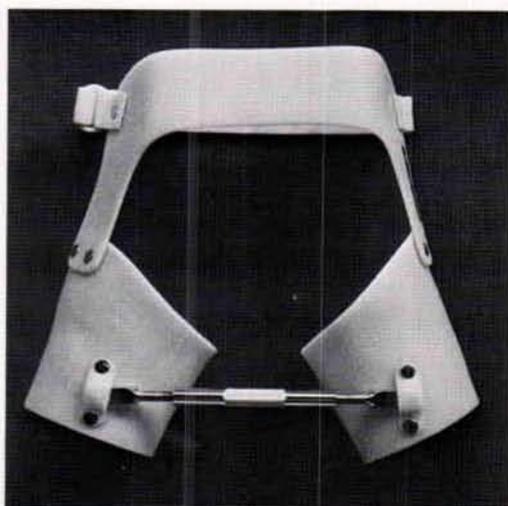


Fig. 3. Posterior view of the Night Splint. The stainless turnbuckle makes it possible to control the angle of the hip joint.

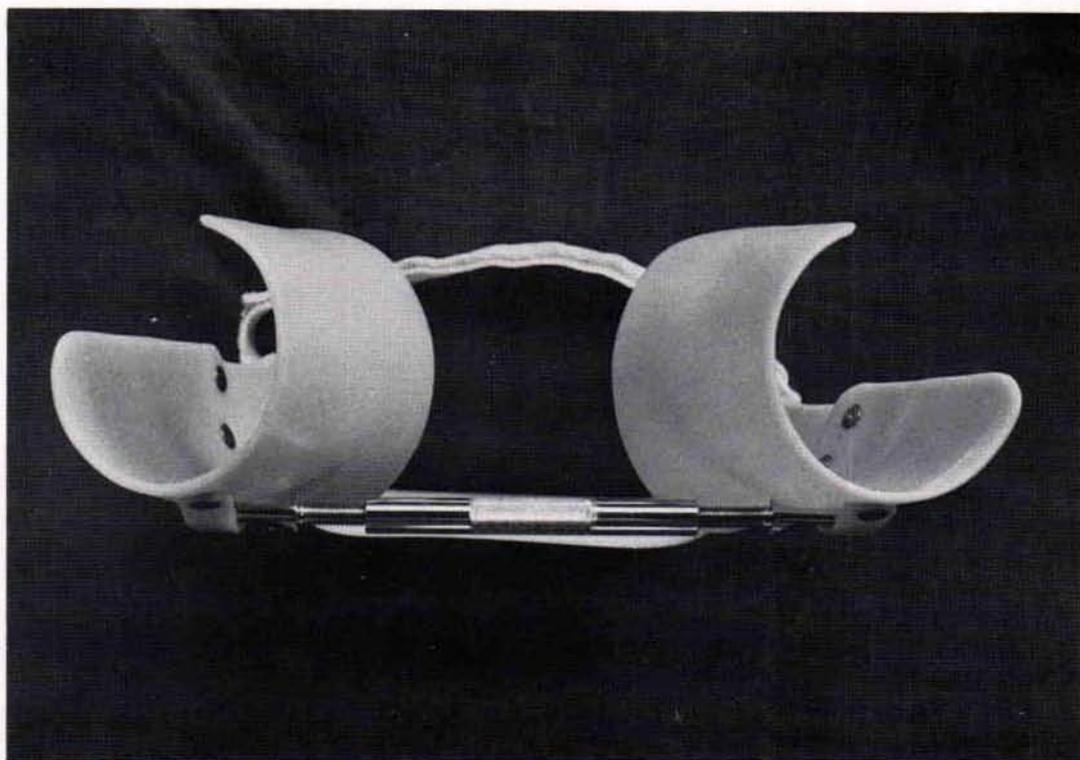


Fig. 4. View of bottom side of the Night Splint.

thus, eliminated the need for casting. For the purpose of fitting the thigh, the thigh cuff is heated by use of a heat gun and modified in shape and size as needed. The total weight is about one pound; far lighter than the common brace. Although this splint is not likely to fall off, it may do so in some patients. In the one case we experienced where it was difficult to hold the brace in place during changes of position, we were able to solve the problem by using Velcro straps on the thigh cuffs.

Clinical Experience

Seven children referred to in Table 1 were treated with the new splints for 16 months. The average CE angle of these

cases who had the scissor legs was 10 degrees, except for the case with complete dislocation. Cases 4 and 5 had sometimes complained of pain in both hip joints. Cases 1, 2, and 3 were bothered with the results of nocturnal enuresis, and all the cases had dermatitis or pigmentation in their genital area. The follow-up period was so short that we could not find any improvement of the CE angle or sphericity of the hip joint by roentgenogram, but the change of position in bed was considered to be smooth and the genital area was kept clean. As the contractures of the adductors were improving steadily, it was easier to passively abduct the hip joints. As shown in Figures 5, 6, and 7, the centralization

Table 1 Cases treated with the splint

No.	Name	Sex	Age	Type of CP	CE angle	
					rt	lt
1	T.K.	m	4	spastic	22	2
2	M.M.	f	7	spastic	lux.	-10
3	K.T.	m	7	spastic		
4	Y.R.	f	8	spastic	15	15
5	K.N.	m	12	spastic	17	20
6	Y.K.	f	14	spastic	lux.	20
7	S.A.	m	15	spastic	2	20
8	K.N.	m	16	mixed	13	-15
					Ave. 10	
					(degree)	

of the hip was good with this splint. Furthermore, their parents and nurses were pleased because it was easy for them to clean the orthosis and to put it on and take it off.

Summary

The methods of treatment for scissor leg should be selected according to the grade of the hip centralization. The

grades consisted of (1) normal hip joint, (2) subluxation, and (3) luxation.

The cases treated with the surgical therapy, for example, the obturator nerve resection and the adductor muscle release operation, it was difficult to determine the indication, and the results were not consistent. Therefore, we treated them by using the abduction brace first.



Fig. 5. Anterior view of Night Splint on the body.

Observing the scissor leg of the CP patients, we found the following features; one, the tonus of the adduction muscles were always superior to that of abductor, mainly medial gluteal muscle, and the force abduction with the excess power only increased the tonus of adductor but with no other effect; two, the muscle relaxed relatively during sleep and the relaxation was increased by the ability to freely change position in bed.

Because the power of the abductors with the common brace was too strong, the reflex tonus of the adductor increased and the changes of position were disturbed. The common braces became dirty as a result of nocturnal enuresis and sweat and caused contact dermatitis.

To overcome these problems we designed the Hip Abduction Splint for use at night.

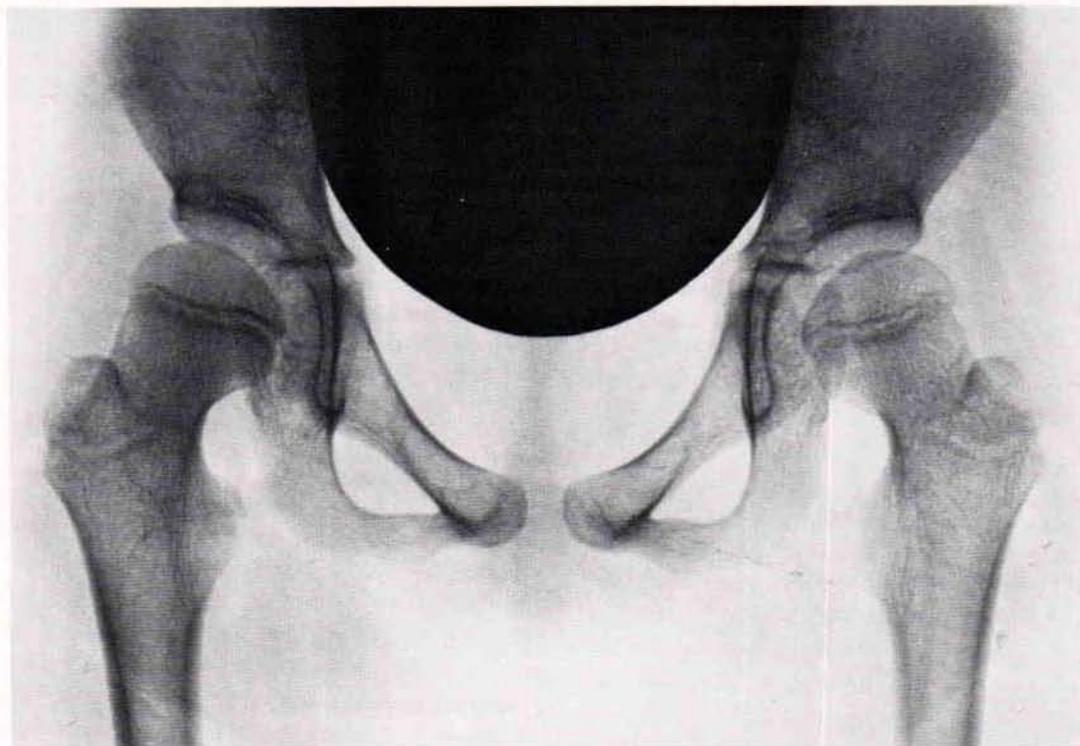


Fig. 6. Roetgenogram of the hip joint without splint.

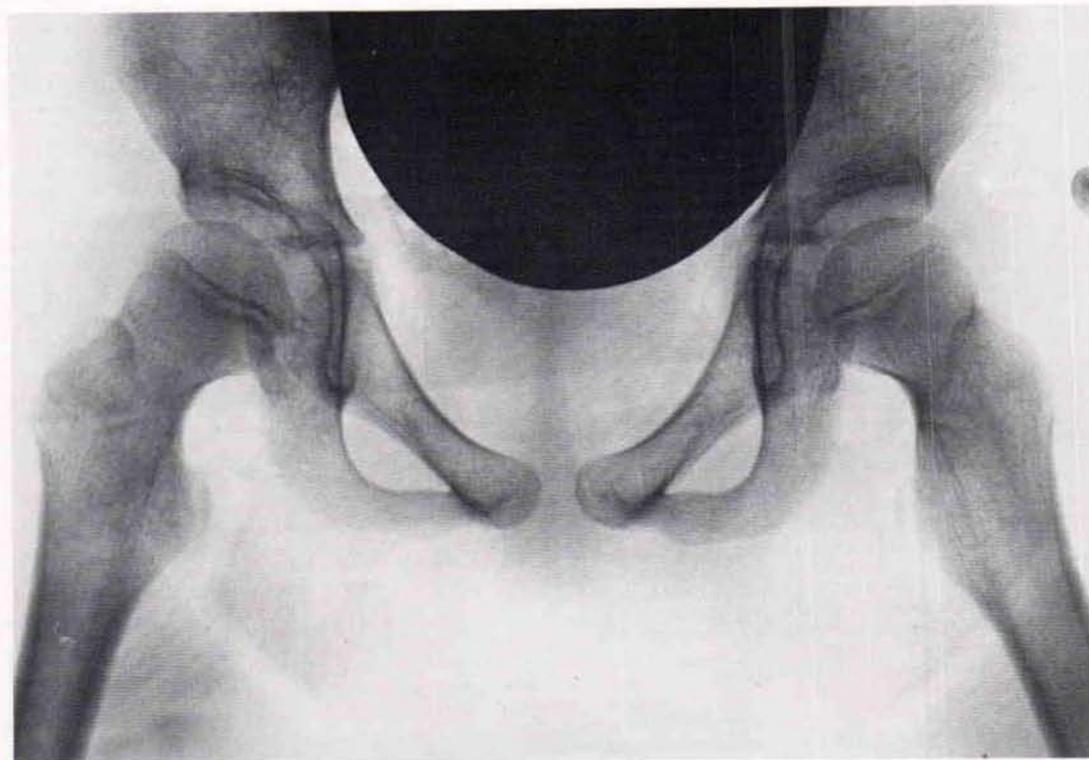


Fig. 7. Roentgenogram of the hip joint with the splint in place. Note that the centralization of the hip is improved.

The advantages of the new splints:

- (1) simple structure
- (2) easy doning and doffing
- (3) excellent durability
- (4) light weight
- (5) easy to keep clean

The disadvantages are:

- (1) correction of rotation not possible
- (2) less strength than the muscle power of the older patients

When we could not find improvement of the contracture of the adductors or of the abduction angle with this splint, we felt that surgical treatment was indicated.

Conclusion

We reported that we designed and used the new Hip Abduction Night Splint which is superior to the braces commonly used. This splint had many

advantages for rehabilitation of the children with cerebral palsy.

Footnotes

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