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# Glutei Paralysis and Tendon Transference. An Evaluatian of A Method

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Summary

A method of tendon transference is employed to relieve the poliomyelitic gluteus limp. We believe that in order to remedy the gluteus limp, opposite sacrospinalis muscle is the best choice as a power source because it works synergistic with the affected glutei. On this belief, we have operated on twenty poliomyelitic patients with affected glutei since 1958. The short term results of this experiment have been found to be satisfactory. There remains, however, much problems to be studied in order to find techniques for building up muscle bulk and its size as a power source.

The poliomyelitic gluteus limp is so peculiar that most orthopedic surgeons are able to make a correct diagnosis at a glance. Its awkwardness is caused mainly by pelvic sagging to opposite side and swaying trunk toward disabled side.

Furthermore pelvic back thrust simultaneously accompanied by increased lumbar lordosis makes the limp more awkward (Inman). To the orthopedic surgeon it presents a serious problem and it is reported that a number of investigators are working on it. So far dozens of surgical procedures, especially in the form of tendon transference have been devised to solve this problem (FRITZ LANCE, KREUSCHER, OBER, BARR, HEY GROVES, MUSTARD, THOMAS).

Most of them have utilized the sacrospinalis muscle on the affected side as a power source. But since ipsilateral sacrospinalis muscle does not work in close harmony with the affected abductor muscles which need to be replaced or reinforced in the phase of walking, such surgical procedures have not been very effective in remedying this condition.

I believe that in order to make such muscle transplantation

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successful and remedy the gluteus limp, opposite sacrospinalis muscle is the best choice as a power source, because it works synergistic with the affected glutei.

Based on this belief, we have operated on twenty poliomyelitic patients with affected glutei since 1958. The purpose of this paper to evaluate the short term results of this experiment.

## OPERATIVE TECHNIQUE

OBER-BARR's method is modified. The patient is placed in the semiprone position, affected side being elevated at an angle of 45 degrees. Local anesthesia has been found preferable.

The thigh incisions are composed of three short ones, i. e. the greater trochanter, mid thigh, and distal portion of the thigh (Fig. 1a). The iliotibial band is divided transversely at the level of the lower pole of patella. A strip of fascia lata, three to four centimeters wide, is dissected upward until the distal one-half of the tensor fasciae latae muscle is mobilized. The key to success in this dissection lies in inserting a metallic measure subcutaneously and dissecting along its edge. This strip is folded into a roll so as to expose the reverse side (Fig. 1b). Defect in fascia is closed with mattress suture.

The next step is to make a tunnel intraosseously or beneath the periosteum at the level of origin of the vastus fibularis muscle. The fascial roll is passed through this tunnel. The opposite lumbosacral incision, six centimeters long, is now made obliquely to the spinous process; The incision ends at a point two to three centimeters lateral to the posterior superior iliac spine (Fig. 1c). The sacrospinalis muscle is exposed and mobilized in a strip six to seven centimeters in length and three to four centimeters in width

Nylon thread doubled or tripled in advance, each 0.5 mm thick, is stitched through this muscle strip. The free end of fascial roll is passed subcutaneously and brought out through the lumbar incision. This tunnel must be large enough to allow the fascial roll to glide freely The free end of the muscle is enveloped by the fascia and fastened securely to each other. Prior to this, Nylon thread passing through this roll is anchored under adequate tension to the greater taonhanter (Fig. 1d).

The incisions are closed. A Plaster cast is applied, maintaining the hip in abduction, extension and neutral rotation.

## AFTER TREATMENT

The cast is bivalved three weeks after operation and rehabilitation program is commenced as follows:

After threeweeks lower spinal muscle training is instituted

After four weeks standing exercise in the bath.
After five weeks crutch walking.
After six weeks self-reliant walking.
After nine weeks climbing stairs, up and down.

## CLINICAL MATERIAL

Fourteen patients have been examined personally. Making use of specially designed equipment from which electrical data are available we analysed sagging of opposite anterior superior iliac spine and swaying of ipsilateral shoulder as the subject walked. Action potential of transferred sacrospinalis is synchronously recorded. The longest preriod of evaluation in this study is four years; the shortest, one year.

## RESULT AND ANALYSIS

Each result is evaluated according to some definite criteria which are based upon total marks scored (Table 1).

Evaluated results, summerized in table 2, have been found to be satisfactory. The only one poor result occurred among the fourteen patients. This case has been reviewed carefully in order to discover the reasons for failure. This patient had no muscle control over the affected lowerextremities before operation.

This patient shows sagging of opposite anterior superior iliac

Table 1.

| Grade | Appearnce of gait | Endurance for walking | Ability to stand on affected leg | Ability to abduct and extend the hip |
|---|---|---|---|---|
| Markedly improved | 4 | 4 | 4 | 4 |
| Moderately improved | 3 | 3 | 3 | 3 |
| Slightly improved | 2 | 2 | 2 | 2 |
| Unchanged | 1 | 1 | 1 | 1 |

| | | | |
|---|---|---|---|
| Excellent | more than | 14 | total marks |
| Good | 〃 | 12 | 〃 |
| Fair | 〃 | 10 | 〃 |
| Poor | less than | 9 | 〃 |

Table 2.

| | |
|---|---|
| Excellent | 4 patients |
| Good | 4 〃 |
| Fair | 5 〃 |
| Poor | 1 〃 |

spine and swaying of ipsilateral shoulder (0.9mV, 0.8mV) respectively, which are far greater than those for normal persons (0.1 mV, 0.1mV) respectively. Addionally, pelvic sagging reveals the biphasic characteristic curve of which lowest point meets the stance phase (Fig. 2).

In these respects these findings are closely similar to those in the case of congenital dislocation of the hip and endorse the positive Trendelenburg phenomenon. On the other hand, transferred sacrospinalis muscle is demonstrated to be in the same phasic action as the hip abductor muscles to be replaced, but its action potential is estimated to be 0.5 mV, slightly higher than for normal persons. This fact indicates that action potential of sacrospinalis in such limited degree is too low to relieve pelvis and shoulder from the positive Trendelenburg phenomenon and swaying toward affected side in the case of complete glutei paralysis.

It is consistently demonstrated that cases of complete glutei paralysis rated excellent or good reveal twice as high amplitude as in the case of normal persons. This has been fo und true of the patient operated on both disabled extremities whose locomotion was preoperatively possible only as a quadruped, but who has gained power of locomotion without aid of any kind as a result of the operation (Fig. 3 a,b).

Fig. 4 illustrates a pattern of pelvic sagging and shoulder sway which is closely similar to one of normal person (Fig. 4 ab). This patient had preoperatively glutei paresis with less disseminated muscle weakness in the left lower extremity, and was postoperatively rated excellent according to above mentioned criteria. Most favorable result may be anticipated in such a case.

## CONCLUSION

In reviewing the results of fourteen patients we are encouraged by the satisfactory results and impressed by the value of this operation.

It is theoretically and practically to be preferred to the other methods on the basis of the present experiment, i.e., that the transferred muscles work in same phase as disabled glutei to be replaced or reinforced.

In order to make substitution of weakened glutei worthwhile, however, powerful activity of transferred muscles is needed.

There remains much problems to be studied in order to find techniques for building up muscle bulk and its size as a power source.

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Fig. 1 a.

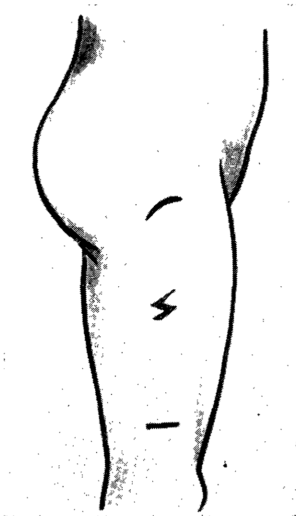


Fig. 1 b.

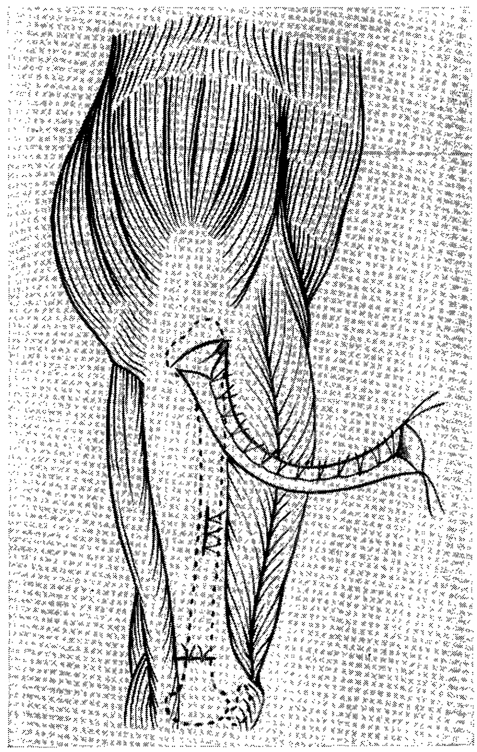


Fig. 1 c.

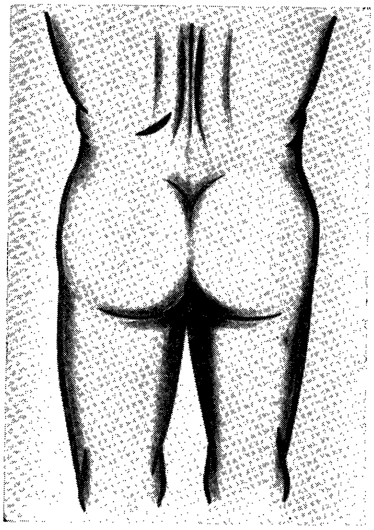


Fig. 1 d.

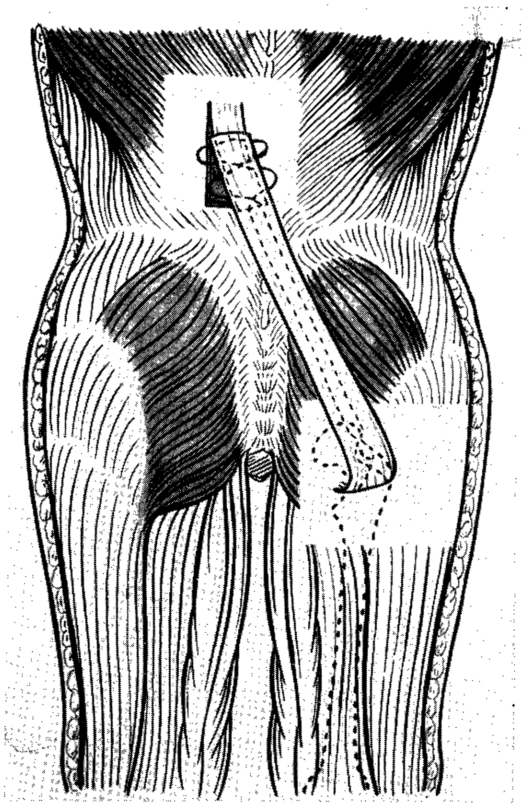


Fig. 2.

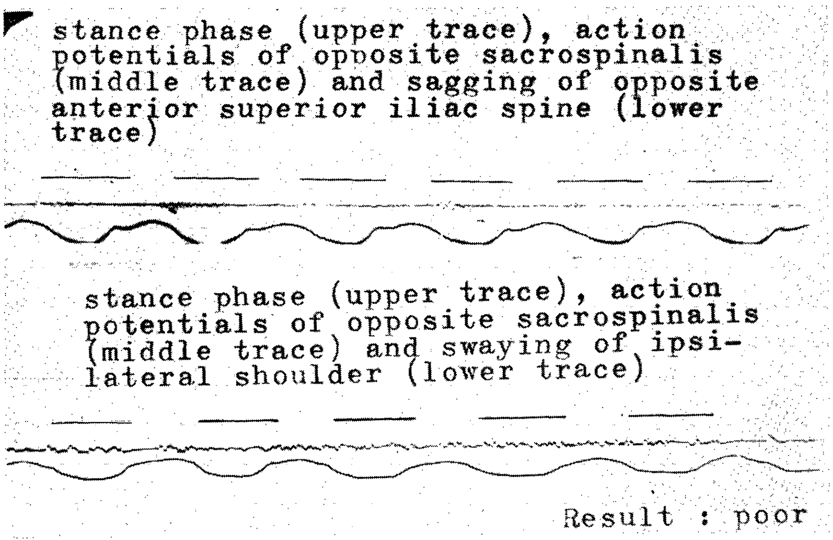



Fig. 3 a.

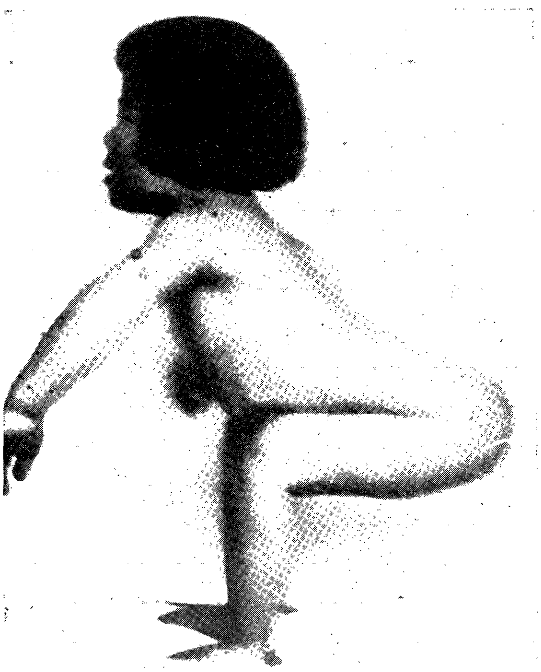


Fig. 3 b.

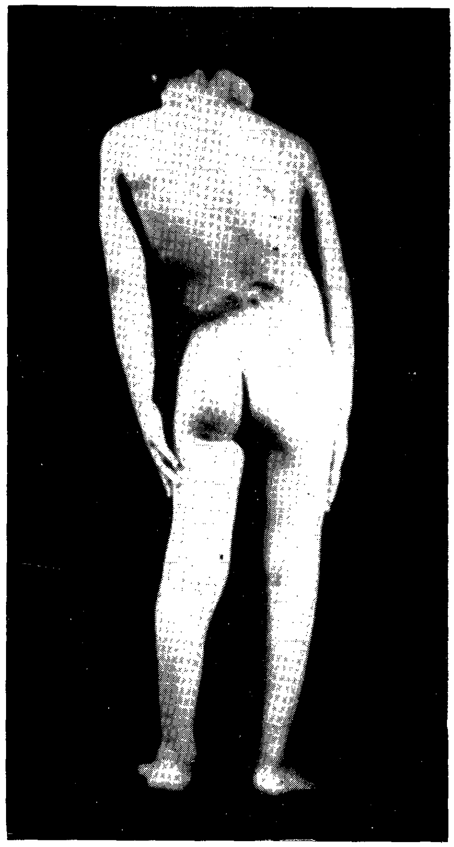


Fig. 4 a.

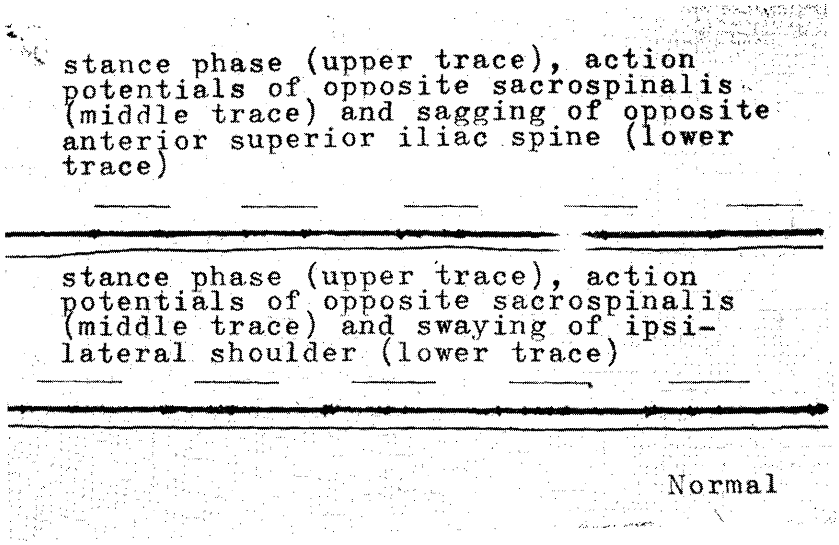
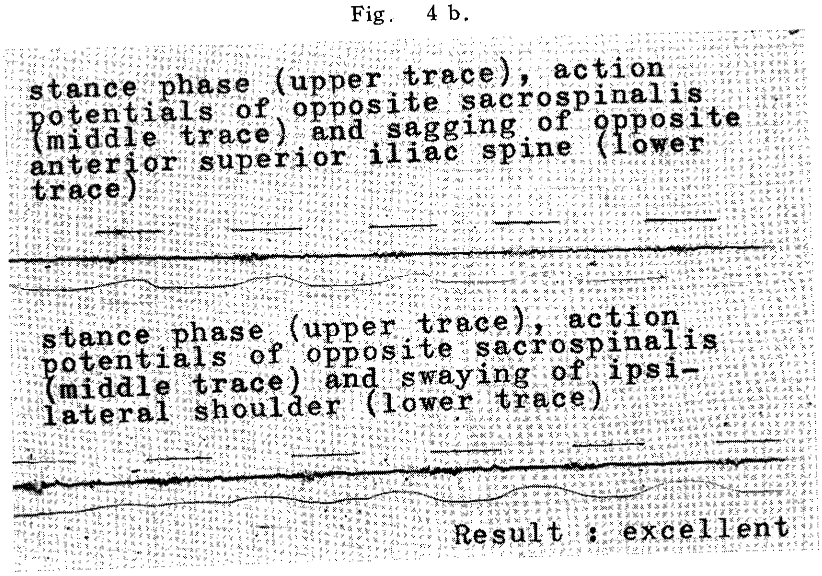

stance phase (upper trace), action potentials of opposite sacrospinalis (middle trace) and sagging of opposite anterior superior iliac spine (lower trace)
stance phase (upper trace), action potentials of opposite sacrospinalis (middle trace) and swaying of ipsilateral shoulder (lower trace)
Normal

Fig. 4 b.


stance phase (upper trace), action potentials of opposite sacrospinalis (middle trace) and sagging of opposite anterior superior iliac spine (lower trace)
stance phase (upper trace), action potentials of opposite sacrospinalis (middle trace) and swaying of ipsilateral shoulder (lower trace)
Result : excellent