Acta Orthop. Belg., 2020, **86 e-SUPPLEMENT** 1, 23-27

ORIGINAL STUDY

Management of severe knee extension stiffness in children: particularity in sub-Saharan Africa

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Knee extension stiffness due to fibrous retraction of the quadriceps is a relatively uncommon condition in children but not so rare in developing countries. It is the result of iatrogenic intra-muscular injection. It is responsible for major functional prejudices in the child. A retrospective study was carried out over a period of 4 years. Twenty children were treated surgically for knee extension stiffness. In 100% of cases it was a severe retraction of the knee. The quadriceps-plasty described by Judet was used in 16 cases and a V-Y quadriceps-plasty in 4 cases. Immediate post-operative physiotherapy was performed every 6 hours with positioning in splint (with every 6-hour alternation between extension and 100°-flexion splint).
The average knee flexion degree was 5° in preoperative period and improved to 103° after the surgery. The final result was considered excellent in 30% and good in 70% of the cases.

Keywords: Knee stiffness in extension ; Judet quadriceps-plasty.

INTRODUCTION

Fibrous retraction of the femoral quadriceps muscle is a relatively rare condition. It is most often due to intramuscular injections but sometimes can be due to unexplained cause *(10)*. The injected medicine is often antibiotics (such as Ceftriaxone or Gentamycin), analgesic and antipyretic drugs (such as Metamizole or Acetylsalicylic acid) and especially Quinine salts (especially in areas of endemic malaria). The resulting fibrous retraction is responsible for a progressive knee stiffness disturbing the child's body pattern and hindering his physical, sporting or psychic activities *(4)*. This disease is reported throughout sub-Saharan Africa in both urban and rural areas *(4,10)*. Purpose of this study is to report our therapeutic management of knee extension stiffness in under-equipped areas.

Conflict of interest: All authors declare that they have not received any funding or other benefits in support of this study. No relevant financial relationships to disclose.

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PATIENTS AND METHODS

This is a retrospective study over a 4 years period (07 October 2012 to 07 October 2016). The study was conducted at the Saint Jean de Dieu Hospital in Tanguiéta, level 4-hospital, based in Northern BENIN in collaboration with a team of surgeon of "Chain of Hope- Belgium". Were included into the study, all children less than 15 years surgically treated for knee extension stiffness due to a acquired quadriceps retraction. The exclusion criteria were: congenital quadriceps stiffness and malformative lesions. All patients received a standard radiograph of the knee (anteroposterior and lateral view) to exclude any dysplasia or bone deformities. The treatment protocol consisted in 2 steps. First the surgery consisted of either a quadricepsplasty according to Judet *(7)* (sometimes associated with a VY plasty), either a VY plasty alone of the quadriceps tendon. The second step in the post-operative period consisted of an intensive physiotherapy and alternative splinting. Immediate post-operative physiotherapy was performed every 6 hours and positioning in splint with every 6-hour alternation between extension and 100°-flexion splints (Fig.1). During the first 3 days, each physiotherapy session was preceded by administration of 15mg/kg paracetamol 15 minutes before replacement of the splint. This physiotherapy was followed by an external rehabilitation for 4 weeks (outside the hospital). The per-operative objective of the Judet's quadricepsplasty associated or not with the VY-plasty, was a flexion of at least 100 ° (Fig. 2). The procedure was performed step by step by a broad lateral approach (Fig. 3). First the fascia lata was incised. The quadriceps was released from the femur over its entire length (Fig. 4) by peeling off the periosteum. An internal arthrolysis was carried out according to Gernez with section of the patellar fin, the excision of the adhesions in recessus suprapatellaris and in trochleo-patellar joint. Finally, according to the obtained degree of flexion, a V-Y shaped aponeurotomy of the quadriceps tendon was in some cases associated (Fig. 5). The stiffness severity was assessed according to the criteria summarized in Table I *(5)*. The results at the latest follow-up were evaluated according to the criteria of SOFCOT (Table II).

Fig. 2. — Full release of the vastus lateralis

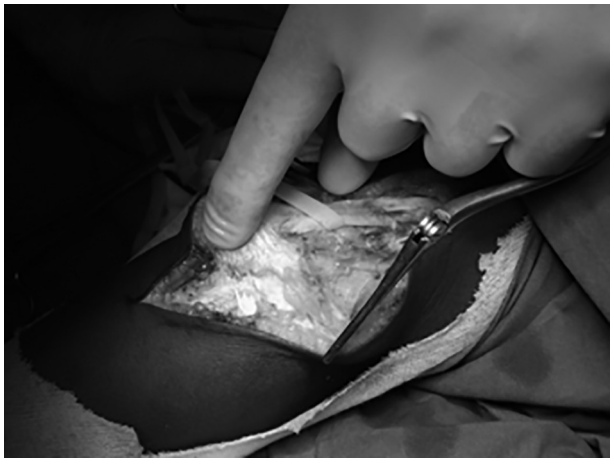

Fig. 1. — Initial lateral approach

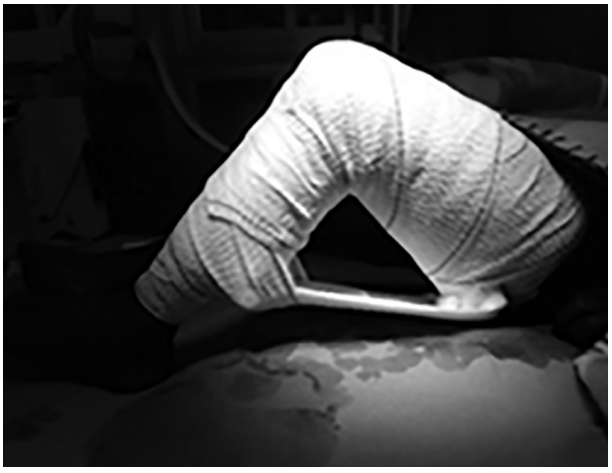

Fig. 3. — Per operative flexion obtained

Fig. 4. — Per operative flexion obtained

RESULTS

In our series 20 children were collected. The mean age of the children at the time of surgery was 4.9 years with extremes ranging from 3 to 13 years. The average time from symptoms onset and surgery was 11 months with extremes ranging from 5 to 48 months. The average hospital stay was 7 days. The left side was the most affected with a male predominance. In 17 cases, a muscle injection was incriminated and quinine was the product used in 10 cases. The main reason for consultation in all patients was a knee flexion defect. Average flexion before surgery was 5° and in 100% of cases the retraction of the quadriceps muscle was considered severe. No dysplastic or malformative lesions had been found on the radiograph. Average flexion after the surgery was 103°. Two complications were encountered during rehabilitation: a cartilage lesion and a wound dehiscence occurred at 5th and 7th post-operative day, respectively.

Table I. — Criteria for stiffness assessment

	Severe	Moderate
Knee flexion angle	≤ 15°	Between 15° and 60°
Hip flexion deficit	≥ 30 °	Between 15° and 30°
Knee stiffness during walking	Yes	Discret
Tilt of pelvis during walking	Evident	Moderate

Table II. — Appraisal of the results at the latest follow-up according to the criteria of SOFCOT

Results	*Active and passive mobility in knee flexion-extension*
Excellent	≥ 120°
Good	90 to 120 °
Average	45 to 90 °

Fig. 5. — Knee bending splint

Follow-up after 12 postoperative months showed favorable result in all patients with normal walking without sequels and resumption of sports activities among those who wished. The final result after 12 months was judged excellent in 6 cases (30%) and good in 14 cases (70%) (Fig.6).

DISCUSSION

Retraction of the extensor apparatus responsible for knee stiffness is a relatively rare condition. The

Fig. 6. — Flexion of 110° obtained after 12 months

Table III. — Clinical data of the 20 patients (R: right; L : left ; IM: Intra muscular Injection; U: Unknown)

Sex	Age	Side	Delay between onset of symptoms and surgery (months)	Etiology	Surgical technique	Pre-operative flexion (°)	Post-operative flexion (°)	Compli-cations	Hospitalisation (days)
F	3	R	48	IM	Judet	0°	100°		5
M	6	L	12	IM	VY	0°	100°		6
M	3	R	6	IM	VY	2°	100°	Cartilage lesion	26
F	5	R	8	IM	Judet	4°	120°		7
M	6	L	24	IM	Judet	10°	100°		6
M	4	R	24	IM	Judet + VY	0°	100°		6
M	4	L	12	IM	Judet + VY	14°	120°		6
F	12	L	6	IM	Judet	0°	100°		6
F	6	L	5	U	Judet	30°	110		5
M	4	L	6	IM	Judet		100°		8
F	4	L	12	IM	VY	0°	100°		6
M	10	L	24	IM	Judet	16°	100°		6
F	5	R	12	IM	VY	0°	100°		6
M	12	R	12	IM	Judet	10°	100°		7
M	13	R	5	U	Judet	12°	100°		6
M	6	R	7	U	Judet	11°	110°	Wound dehiscence	12
M	7	R	6	IM	Judet	0°	110°		8
M	9	L	9	IM	Judet	4°	100°		8
F	11	R	10	IM	Judet	15°	110°		5
F	7	L	48	IM	Judet	0°	100°		5

relationship between intra-muscular injections and the secondary occurrence of a retraction of the femoral quadriceps had already been mentioned *(6)*. Intravenous drug administration has considerably reduced the incidence of this disease in developed countries *(1)*. Our epidemiological data are similar to those in the literature, which stipulates that the retractile fibrosis of the quadriceps is predominant in the boy and that intra-muscular injections constitute the main cause with quinine as the first product *(8)*. The retraction of the quadriceps muscle was severe in 100%. Several surgical techniques have been described: VY- or Z-plasty of the quadricipital tendon, Thompson-Payr's plasty and Judet's quadricepsplasty. Many other quadriceps tendon plasties have been described, but were abandoned due to high cutaneous necrosis, infection and active extension deficit *(9)*. In our series the Judet's quadricepsplasty was performed in 16 patients and was associated with a VY elongation of the quadricipital tendon in 2 cases. The VY elongation of the quadriceps tendon alone was used in 4 patients (younger children). In our series the average flexion obtained after surgery was 103°. At recent follow up, our results were excellent in 30% of cases and good in 70% of cases. Burnei et al with the Judet's technique obtained a postoperative flexion gain of 85° *(3)*. No per-operative complications such as patella fracture or vasculonervous lesions were noted in our series. Two post-operative complications were encountered. A cartilaginous lesion and a wound dehiscence, due to forced physiotherapy. This immediate physiotherapy is the originality of our technique. The splint change

was preceded by analgesic, making it less painful and more acceptable to the parents and the children themselves. Indeed, in our series the arthromotors were not used as recommended because they were not available in our hospital. Continuous passive mobilization was thus replaced by alternating splints in flexion and extension changed every six hours just after the intervention during the first 72 hours. No deep infection necrosis or post-operative compartment syndrome was found in our series, as it was the case for Bellemans et al. *(2)*.

CONCLUSIONS

Fibrous retraction of the quadriceps is a relatively rare condition in developing countries. If surgery is its basic treatment, the best functional results are obtained in the patients mobilized very early in post-operative by means of a multidisciplinary management associating orthopedist, physiotherapist and anesthetist.

REFERENCES

1. **Alvarez E, Munters M, Lavine L, Manes H, Waxman J.** Quadriceps myofibrosis. A complication of intramuscular injections. *J Bone Joint Surg Am* 1980 ; 62 : 58-60.
2. **Bellemans J, Stweenwercks A, Brabants K** *et al.* The Judet quadriceps plasty: A retrospective analysis of 16 cases. *Acta ortho Belg* 1996 ; 62 : 79-82.
3. **Burnéi G, Neagoe P, Margineanu BA, Dan DD, Bucur PO.** Treatment of severe iatrogenic quadriceps retraction in children. *J Pediatr Orthop B* 2004 ;13 : 254-258.
4. **Fiogbe MA, Gbenou AS, Magnidet ER, Biaou O.** Distal quadriceps plasty in children: 88 cases of retractile fibrosis following. *Orthop Traumatol Surg Res* 2013 ; 99 : 817-822.
5. **Hung NN.** Analysis of two different techniques in the treatment of knee stiffness in swing phase due to fibrous rectus femoris muscle in children. *J Pediatr Orthop B* 2011 ; 20 : 164-172.
6. **Jackson AM, Hutton PA.** Injection-induced contractures of the quadriceps in childhood. Comparison of proximal release and distal quadriceps plasty. *J Bone Joint Surg Br* 1985 ; 67 : 97-102.
7. **Judet J, Judet R, Lagrange J.** Technic of liberation of the extensor apparatus in knee stiffness. *Mem Acad Chir* (Paris) 1956 ; 82 : 944-947.
8. **Milcan A, Eskandari MM, Oztuna V, Colak M, Kuyurtar F.** Injection-induced contracture of the quadriceps femoris muscle in children. *Orthopedics* 2004 ; 27 : 65-66.
9. **Onimus M, Brunet L, Gaudeuille A, Mapouka AI.** Treatment of complications of intramuscular injection of quinine salts in Africa. *Med Trop* 2007 ; 67 : 267-273.
10. **Soumah MT, Sylla AI, Toure MR** *et al.* Quadriceps fibrosis following intramuscular injections into the thigh: apropos of 92 cases at the Ignace Deen Central University Hospital in Conakry. *Med Trop* 2003 ; 6 3: 49-52.