SCIENTIFIC ARTICLE

Soft Tissue Surgery for Adults With Nonfunctional, Spastic Hands Following Central Nervous System Lesions: A Retrospective Study

Laure Gatin, MD,* Alexis Schnitzler, MD, PhD,†‡ Fabien Calé, MD,* Guillaume Genêt, BS,§ Philippe Denormandie, MD,*§ François Genêt, MD, PhD†§

Purpose Soft tissue surgery for upper extremity contractures can improve hygiene, pain, and appearance in adults with central nervous system lesions. The goal of such interventions is highly individual; thus, goal attainment scaling (GAS; a method of scoring the extent to which patient's individual goals are achieved [5 levels] in the course of intervention and using T score values) is pertinent to evaluate outcome. The objective of this study was to assess the effect of soft tissue surgery for upper extremity muscle contractures in patients with central nervous system lesions using GAS.

Methods Retrospective data from 70 interventions were included (63 patients; 23 women). The mean age was 51.3 ± 16.2 years (range, 24.2−87.0 years). The primary goal was to improve hygiene (n = 58), pain (n = 10), or appearance (n = 2). The etiologies were stroke (n = 35), traumatic brain injury (n = 16), cerebral anoxia (n = 4), neurodegenerative disease (n = 6), and cerebral palsy (n = 2). The GAS score was calculated before surgery and 3 months after surgery.

Results The T score (which took into account the weight of each goal) was 52.3 at 3 months (38.5 before surgery), corresponding to a "better than expected" outcome. The mean of the differences of the GAS score for each goal before and after surgery increased by 1.27 for hygiene, 1.06 for pain, and 1.00 for appearance.

Conclusions Soft tissue surgery can safely and effectively improve hygiene, pain, and appearance in adults with cerebral damage. The preoperative evaluation should be multidisciplinary. The GAS is a useful tool to assess the effectiveness of orthopedic surgery for these patients. *(J Hand Surg Am. 2017;■(■):1.e1-e7. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words Spastic hands, soft tissue surgery, neuro-orthopaedic surgery.

Surgery to improve function but also aesthetic appearance, personal hygiene, and reduce pain has become an important part of the management of patients with central nervous system (CNS) damage as life expectancy and patient expectations of recovery and quality of life have increased. Stroke is an important cause of death and disability.[1] About 30% of patients with hemiplegia develop spasticity, which, along with paresis (loss of motor control), reduces active and passive function, renders hygiene

*From the *Service de Chirurgie orthopédique et traumatologique; the †Service de Médecine Physique et de Réadaptation, Hôpital Raymond Poincaré, Assistance Publique—Hôpitaux de Paris, Garches; the ‡Université Versailles Saint Quentin en Yvelines, HANDI-ReSP (EA4047); and the §Université Versailles Saint Quentin en Yvelines, UFR des Sciences de la Santé—Simone Veil, Montigny le Bretonneux, France.*

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Corresponding author: François Genêt, MD, PhD, Service de Médecine Physique et de Réadaptation, CHU R.Poincaré, 104 Bd R.Poincaré, 92380 Garches, France; e-mail: francois.genet@aphp.fr.

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difficult, can cause pain, and may be less desirable aesthetically.[2] Spasticity is also strongly involved in the cascade of reactions that lead to contractures of muscles and tendons.[3] Contractures may become fixed and increase disability if they are not well managed initially.[4] Botulinum toxin injection (BONT) is an effective method to reduce muscle overactivity; however, once contractures have become established, BONT has no effect (a shortened muscle no longer responds to BONT). There is much literature on surgical interventions for contractures of the upper extremity muscles in children[5]; however, there are few publications on such contractures in adults[6,7] Descriptions of typical deformities in adults and possible treatments have not been well described. In adults, hand deformities are usually caused by a mix of spasticity and contractures of certain intrinsic and extrinsic hand muscles. Muscle balance must be carefully assessed because a fixed deformity may mask overactivity of antagonist muscles. Motor nerve block can increase the precision of the joint examination. If surgical intervention is deemed appropriate, the goal of the intervention must be determined with the patient and/or caregivers because the perception of the deformity depends very much on the individual.[7,8] Moreover, patients' and caregivers' complaints and desires are often imprecise and heterogeneous and may be affected by cognitive impairment of the patient. The treatment should, therefore, be tailored to each patient. Another consideration is the possibility of progression of the disease for conditions such as multiple sclerosis.[8]

Surgical interventions are usually carried out on the soft tissues (tendon or muscle lengthening or tenodesis), occasionally, the joint or, rarely, the bone.[9] Only 1 study has shown soft tissue surgery alone to be effective in improving hygiene (easier cleaning of the palm), although there was no functional improvement.[10] Many different surgical techniques can be used to improve the passive function and/or active function of spastic, contracted hands after CNS lesions.

The aim of this retrospective study was to describe the results of surgical interventions of the soft tissues for different types of upper extremity deformities in which the goal was purely passive (to improve passive range of motion and/or positioning of the upper extremity in space). We sought to specify the indications for surgery and to evaluate the short-term results of each intervention relative to 3 main goals selected by the patients and caregivers: hygiene, appearance, and pain, using goal attainment scaling (GAS).[11]

MATERIALS AND METHODS

This study was a single-center retrospective series of patients with CNS damage who underwent upper limb surgery in our hospital between January 2010 and April 2015. All patients with CNS lesions who underwent soft tissue surgery for their nonfunctional upper limb extremity (to improve only the hygiene, the aesthetic appearance, and/or the pain) were included. All the interventions were performed by 1 surgeon (P.D.).

Evaluation

Data collection was carried out retrospectively and included age, sex, etiology of the CNS lesion, time from onset of CNS lesion to surgery, previous treatments for the deformity, motor function, and the neurological examination (any extrapyramidal disorders, movement disorders such as athetosis, and hemispatial neglect). The clinical examination performed by the surgeon during multidisciplinary consultations was sometimes supplemented by selective motor nerve blocks (injection of lidocaine 1%, without epinephrine, around the nerve, under electrical stimulation guidance), in order to differentiate between joint contracture and muscle overactivity, and to assess the activity of the antagonist muscles.[7] All patients in this series were found to have no appreciable functional potential in the hand.

One primary goal was then determined by consensus with the patients and their health care teams and, when possible, their families, using GAS.[11,12] A list of 3 goals was proposed to help to determine the primary goal (facilitate hand hygiene, decrease spontaneous pain or pain during mobilization, and improve appearance) (Table 1). One primary goal, and up to 2 secondary goals, were chosen from this list. All patients were scored −1 before surgery (baseline). The GAS was scored on a 5-point scale (−2, the least favorable outcome [worse than preintervention]; −1, no change from preintervention [baseline] or improvement toward the goal without goal attainment at the time of assessment; 0, expected outcome after treatment [and therefore, the "most likely" level]; +1, a better outcome than expected; and +2, the best possible outcome that could have been expected for this goal).

Improvement was evaluated by patients and/or caregivers at the 3-month follow-up.

Although the aim of the interventions was not to improve function, the House functional classification was rated prior to surgery and 3 months after surgery in order to assess if any functional improvement had occurred.[13]