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CASE REPORT
Breast

Hyperspasticity After Partial Neurectomy for Treatment of Myospasms Following Subpectoral Breast Reconstruction

Frederik P. Mamsen, MS
Lena F. Carstensen, MD*†

Summary: Breast reconstruction using tissue expander is a frequently used method of reconstruction after mastectomy. We describe a rare complication of myospasms after subpectoral tissue expander reconstruction with acellular dermal matrix. The patient gradually developed disturbing pectoral muscle spasms lasting almost a year. Botulinum toxin A was undesired due to its transient effect. Selective denervation of the medial pectoral nerve branches was performed and resulted in worse spasms where the breast bounced at a rapid speed. Complete denervation of the pectoral nerves led to immediate liberation. We recommend a cranial denervation of both medial and lateral pectoral nerves to secure complete denervation leading to permanent relief of involuntary spasms where selective denervation may lead to hyperspasticity. *(Plast Reconstr Surg Glob Open 2019;7:e2278; doi: 10.1097/GOX.0000000000002278; Published online 21 May 2019.)*

Pectoralis muscle spasm is a rare complication after breast reconstruction with subpectoral implants. Treatment options include injection of botulinum toxin A (BTX-A) or denervation of the pectoralis major (PM) muscle.[1–5] We describe a case of severe pectoral muscle spasms treated by transection of the medial and lateral pectoral nerves, where previous selective denervation of the medial pectoral nerve (MPN) had been insufficient.

CASE REPORT

A 58-year-old woman, diagnosed with cancer of the right breast, underwent mastectomy, sentinel node biopsy, and subpectoral tissue expander reconstruction with acellular dermal matrix as lower pole support. The expander prosthesis was gradually expanded over 6 weeks to a volume of 380 ml. After a delay period of 4 months, it was replaced with a permanent anatomical implant of 210 ml. A capsulorrhaphy was performed in the lower lateral part to reduce the width of the pocket.

Two weeks postoperatively, the patient complained about small involuntary pectoralis contractions and sting-

*From the *Department of Cellular and Molecular Medicine, University of Copenhagen, Copenhagen, Denmark; and †Department of Surgery, Section of Breast surgery, Hospital of Southwest Jutland, Esbjerg, Denmark.*

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The dissection was conducted on a deceased adult who, under Danish Legislation (Health Law no. 546, §188), had bequeathed her body to science and education at the Department of Cellular and Molecular Medicine, Panuminstituttet, University of Copenhagen. The study was approved by the head of the Body Donation Program at the Dept. of Cellular and Molecular Medicine.

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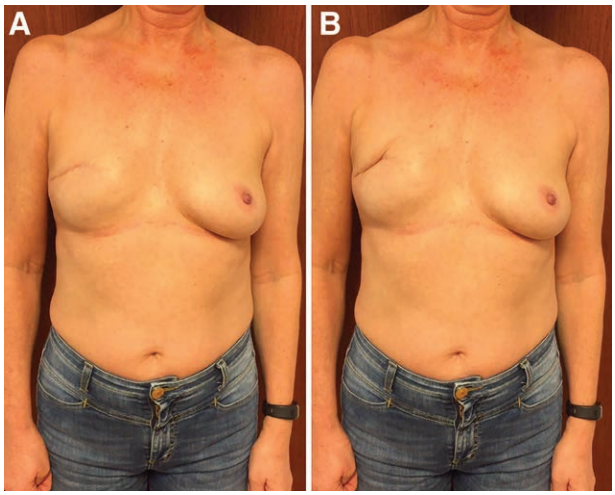

Fig. 1. The right breast before denervation of the PM. A, The PM is relaxed, and the breast has a natural shape. B, The PM is contracted, which causes distortion of the breast and discomfort.

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Video Graphic 1. See video, Supplemental Digital Content 1 which displays a comparison between pre- and postdenervation of the right pectoralis major muscle and shows great results. Tests of range of motion indicate no change, but atrophy of the breast is slightly noticeable. This video is available in the "Related Videos" section of the Full-Text article on PRSGlobalOpen.com or available at http://links.lww.com/PRSGO/B100.

ing pain radiating lateral from the cicatrices. There had been no such symptoms during the expansion period. Progressively, the involuntary spasms increased in number and strength, and the patient returned after 11 months (Fig. 1). The spasms would occur in any position of the arm and even woke the patient up at night. The patient had tried over-the-counter pain medication and muscle relaxants without effect (chlorzoxazone). The surgeon suggested treatment by BTX-A, but the patient declined, as she did not want to depend on regular treatments. The subcutaneous fatty layer was very thin, and we did not consider pocket change to prepectoral a good option.

Because the spasms were located in the lower, lateral part of the PM, which is innervated by the branches of the MPN, a selective denervation of the MPN was scheduled (**SDC1 – see** video, Supplemental Digital Content 1, which displays a comparison between pre- and postdenervation of the right PM and shows great results. Tests of range of motion indicate no change, but atrophy of the breast is slightly noticeable, ***http://links.lww.com/PRSGO/B100***).

Through the original incision, the surgeon dissected cranially between the capsule and the PM. Four small MPN branches were located and transected using electrocautery. Three of these branches perforated the pectoralis minor muscle and 1 was located lateral to it. The lateral pectoral nerve was spared. During recovery the patient

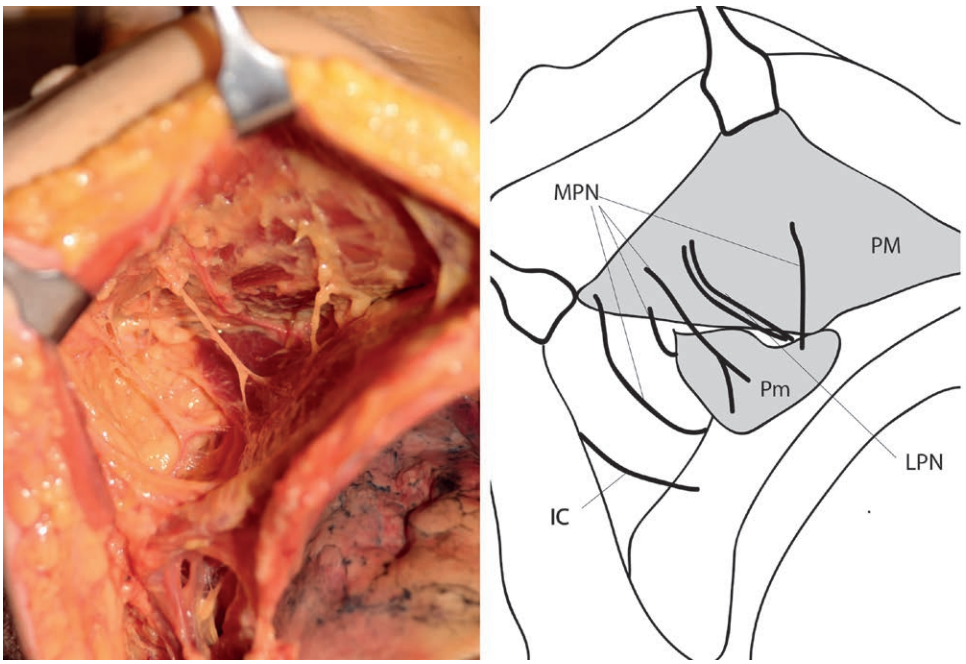

Fig. 2. Dissection photograph of the nerves of the right pectoral region of a female cadaver with a similar nerve distribution as our patient. The space between the pectoralis major and minor muscles has been exposed through a wide incision in the inframammary fold. The dissection has been carried through all the way to the muscle attachments to the coracoid process and the clavicle. The PM and the breast are lifted by 2 retractors. The LPN is visible near the thoracoacromial artery on the deep side of the PM. In this specimen, there are 4 branches of the MPN. Two branches pierce the Pm and 2 branches run lateral to the muscle. These branches are not to be confused with the IC. Note that 1 branch emerges just caudal to the muscle attachment to the coracoid process. The dissection was conducted on a deceased adult who, under Danish Legislation (Health Law no. 546, §188), had bequeathed her body to science and education at the Department of Cellular and Molecular Medicine, Panuminstituttet, University of Copenhagen. The study was approved by the head of the Body Donation Program at the Dept. of Cellular and Molecular Medicine. IC, intercostal nerves; LPN, lateral pectoral nerve; Pm, pectoralis minor muscle.

developed even worse contractions, making her breast bounce at a rapid speed without pause. A subacute surgery was performed the following day. The lateral pectoral nerve branches were transected, and a small MPN branch with a very cranial origin lateral to the coracoid process (Fig. 2). The result after the second procedure was immediate. Seven months after complete denervation of the PM, the patient is still without any spasms or pain, and she has no subjective changes in shoulder function and has full range of motion (**SDC1**).

DISCUSSION

We present a case with involuntary muscle spasms after breast reconstruction treated by neurectomy, where partial neurectomy led to hyperspasticity.

Muscle spasm is a known complication after reconstructive surgery using pedicled PM flaps.[6–8] Similar myospasms may occur as a rare complication after cosmetic or reconstructive breast surgery with a subpectoral pocket, but only a handful of cases have been reported (Table 1). A similar, yet much more common, side effect of subpectoral implants is breast animation deformity (BAD). Pectoral denervation for BAD had been performed for decades,[10] and some surgeons routinely transect the MPN[11] or both nerves[12] for better implant projection. A different approach may be reattachment of pectoral muscle with supportive injection of BTX-A[13].

As for BAD, there is no standardized treatment for involuntary pectoral spasms. Treatment options include transection of the pectoral nerves, injection of BTX-A or pocket change to prepectoral placement.

The first reported treatment of PM spasticity using denervation was by Mast,[6] who described pectoral myospasms after sternal wound reconstruction with bilateral PM flaps. Immediately after complete transection of the pectoral nerves, the spasms stopped permanently.

BTX-A is a conservative noninvasive procedure and would be the treatment of choice, if it were not for the transient effect and expected life-long treatment with regular intervals, which may be costly and controlling.[14] No dose-effect study has been published, but several cases have been described with various outcomes (Table 1).

Table 1. Reported Cases of Pectoral Spasms Caused by Subpectoral Implants and Pedicled Pectoralis Major Flaps

Article	Type of Patients	No.	Treatment	Dosage	Interval	Result	Follow-up
Subpectoral Implants							
Maderna et al[2]	Tissue expander reconstruction	1	Removal of implants			No effect	
			EMG- and ultrasound-guided BTX-A			Cramp reduction	
Figus et al[5]	Latissimus dorsi flap Subpectoral implant	2	BTX-A injection	100 units*	One single treatment	Complete relief	12 mo
O'Donnell[1]	Subpectoral implant reconstruction (left)	1	EMG-guided BTX-A injection	75–100 units*	Injections every 3 mo	Transient relief	Unknown
	Subpectoral implant reconstruction (bilateral)	1	EMG-guided BTX-A injection	250 units†	One single treatment	Complete relief	1 mo
Govshievich et al[3]	Lumpectomy Bilateral mastectomies Expander–implant reconstruction Bilateral spasms	1	Replacement of implants			No effect	
			Local anesthetic	10 ml of 0.5% ropivcain		Transient relief	
			Complete pectoral denervation			Spasms nearly gone	6 mo
Adkinson et al[4]	Failed tissue expander reconstruction Subpectoral TRAM flap reconstruction.	1	BTX-A injection	Unknown dosage*	NA	Transient relief	
			Complete pectoral denervation			Marked improvement	9 mo
Wong[9]	Subpectoral implant reconstruction	1	BTX-A injection (intramuscular and subcutaneous)	200 units‡	Several months	Transient relief of spasms	
			Lateral n. Pectoralis denervation			Minimal relief	3 mo
			Transection of muscle attachments			No effect	9 mo
			Open capsulectomy and explantation without reconstruction			Complete relief of spasms	5 y
Pedicled Pectoralis Major Flaps							
Mast[6]	Sternal wound reconstruction with bilateral PM flaps	1	Relaxants Valium Baclofen			Little effect	
			Complete pectoral denervation			Complete relief of spasms	
Trignano et al[8]	Head and neck reconstruction with denervated portion of muscle	2	Ultrasound-guided BTX-A injection	100 units*	4 mo	Transient relief	18 mo
		9			One single treatment	Complete relief of spasms	12 mo

*Botox, Allergan, Inc., Irvine, Calif.
†Dysport, Ipsen, Scottsdale, Ariz.
‡Unknown product.

Only 2 studies report full recovery of PM twitching after breast reconstruction after one single treatment.[5,13] Other studies describe less effect after repeated treatments, which eventually led to surgical denervation.[3–5,9]

Wong presented a complicated case, where neither BTX-A injections nor denervation was enough to treat myospasms after subpectoral implant reconstruction. Explantation eventually led to relief of spasms.[9] The unsuccessful neurectomy in this case may be due to residual MPN branches. The location and number of MPN branches in the interpectoral space is very variable,[11] and it is important to release all its branches for complete PM denervation. In our case, denervation was successful after the second procedure where all the remaining nerves were transected.

The cause of muscle spasticity is unknown. The fact that muscle twitching has never been described in free flap surgery but is well known in pedicled flaps[8] suggests that the remaining innervation is the cause of spasms. The hyperspasticity found in our case after partial neurectomy has not been described before. During the initial procedure, we divided the MPN to the lower part of the PM, which resulted in postoperative spasms involving the entire muscle, including the part innervated by the lateral pectoral nerve. We decided on a second procedure because spontaneous regression was unlikely, and the result was immediate.

CONCLUSIONS

Denervation of PM is an effective, permanent treatment of involuntary muscle contractions after subpectoral breast reconstruction if performed properly. The nerve anatomy is variable, and all nerve branches must be divided to avoid hyperspasticity or lack of effect. It is, however, an irreversible paralyzation of the muscle, which will eventually atrophy and become fibrotic. This treatment should be restricted to patients with severe, disabling spasms.

Frederik P. Mamsen, MS
University of Copenhagen – Panum
Blegdamsvej 3B
København 2200 DK, Denmark
E-mail: fmamsen@hotmail.com

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