

Inverted Nipple Treatment and Poliglecaprone Spacer

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Abstract

Introduction Nipple inversion is defined as a non-projectile nipple. It is a frequent pathologic condition, in which the whole nipple, or a portion of its, is buried inward towards the lactiferous duct and lies below the plane of the areola. Numerous strategies have been described to correct nipple inversion. All the procedures have the purpose to give a good shape to the nipple, preserving its function and sensitivity, when it is possible. To avoid recurrences and to obtain good aesthetic results, we present a modified percutaneous technique.

Method We performed a retrospective study between 2011 and 2016 and included all the cases of inverted nipples treated in our department. Our modified percutaneous technique consists of a minimal incision supported by a percutaneous suture as a temporary spacer to fill the defect caused by releasing the fibro-ductal bands.

Results A total of 41 cases of inverted nipples were corrected in 32 patients. After 1 year of follow-up, no

recurrence was observed and all nipples maintained complete eversion. There was only one case of partial unilateral necrosis in a patient who underwent tumorectomy and radiotherapy. All patients were satisfied with the aesthetic outcomes.

Conclusion This is a simple, safe and cheap technique that should be considered as a reliable method for long-term correction of nipple inversion.

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Keywords Inverted nipple · Percutaneous · Poliglecaprone spacer

Introduction

Nipple inversion, firstly described by Astley Cooper in 1840 [1], is defined as a non-projectile nipple. It is a frequent pathologic condition, in which the whole nipple, or a portion of its, is buried inward towards the lactiferous duct and lies below the plane of the areola. Its prevalence varies from 2 to 10% of women [2, 3], and it is associated with aesthetic, functional and psychological consequences. It can result in functional difficulties in maintaining hygiene, continued inflammation or irritation and often inability to nurse. Moreover, this deformity can cause profound psychological distress with feelings of inadequacy and important psychosexual implications [3–5].

Clinically, nipple inversion can be congenital or acquired (sign of macromastia, mastitis and mammary carcinoma and after breastfeeding or breast surgery),

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unilateral or bilateral, and it has different degrees of severity [3]. It was classified by Schwager [2], as being “umbilicated”, if it is intermittently inverted and “invaginated”, if it is permanently inverted.

Today, Han and Hong’s classification is used as a guideline to determine diagnosis and surgical correction of nipple inversion, according to their grade of severity and fibrosis [6, 7].

Numerous strategies have been described to correct nipple inversion. They can be divided into conservative and operative treatments [8].

The first include manual traction, piercing [9, 10] or vacuum aspiration [11, 12] and are used for grade I inverted nipples, and the second are used in the management of grades II–III inverted nipples and include dermal and dermoglandular flaps [3, 4, 13, 14], endoscopic release [15], internal suture [16, 17] and interposition of alloplastic and autoplatic materials [7, 18].

All the procedures have the purpose to give a good shape to the nipple, preserving its function and sensitivity, when it is possible.

However, the diversity of the described techniques suggests that there is no single technique that is totally successful, resulting in a durable and long-term correction [8].

The risk of recurrence is a common problem, most important in percutaneous surgical methods, and it often causes frustration in patients and surgeons [8, 19].

A minimal-access technique associated with a monofilament purse-string was presented by Kolker et al. in 2009, but recurrence rates remained high in cases of severe grade inversions [8].

To avoid recurrences and to obtain good aesthetic results, we present a modified percutaneous technique that consists of a minimal incision supported by a percutaneous suture as a temporary spacer to fill the defect caused by releasing the fibro-ductal bands.

Method

We performed a retrospective study between 2011 and 2016 and included all the cases of inverted nipples treated in our department.

All the patients were treated by the described surgical technique.

The results were evaluated during follow-up evaluations at 3 weeks and 1 year by clinical examination. The following criteria were estimated: post-operative complications, absence of recurrence, nipple projection and patient satisfaction.

Surgical Technique

Our procedure is performed under local anaesthesia: lidocaine 1% with adrenaline is infiltrated into the whole nipple-areola complex. Then, a hook is used to place a temporary traction suture that will allow us to more easily evert the nipple and will facilitate manipulation. A small knife (number 15 or 11) is used to make a minimal incision (2–3 mm) at the 6 o’clock position at a level below the nipple-areolar transition point, to minimize the risk of devascularization. The subareolar retracted fibro-ductal tissue is cut, in a sweeping circumferential movement.

Through the same incision site, a percutaneous purse-string suture was made, using absorbable monofilament thread (3-0 poliglecaprone). The thread exits the skin and re-enters in the same point each 3–4 mm, around the base of the nipple. The suture is closed at 6 o’clock, under moderate tension. Several knots are made, and the whole “rope” is passed through the opposite site (at 12 o’clock), as a temporary spacer.

The incision site is closed with a simple point using a 4-0 polyglactin suture. The nipple is dressed with non-adherent perforated gauzes, to avoid nipple compression:

Operative time is about 10 min for each nipple (Fig. 1 and Video 1).

No antibiotic therapy and/or retractor instrument was applied.

We advise patients not to wear compressive brassieres for about 2 weeks after surgery.

Results

A total of 41 cases of inverted nipples were corrected in 32 patients.

Twenty-one patients had unilateral nipple inversion, and 11 had bilateral inversion.

They all asked for surgical correction to improve the aesthetic appearance of the nipple.

The ages of patients ranged from 17 to 44 years (mean age, 28 years).

The majority of patients (27 patients) had congenital deformities and a normal clinical breast examination before surgery, without any personal or family history of breast cancer.

There was only one case of postsurgical inversion, in a patient who had undergone tumorectomy and radiotherapy after breast cancer.

According to Han and Hong’s classification [6], all nipples were classified as inversion grades II or III.

Fig. 1 Surgical procedure. **a** Preoperative aspect. **b** After local anaesthesia, temporary traction suture easier to evert the nipple. A minimal incision was done at 6 o'clock position in order to release fibro-ductal elements. **c** Placement of percutaneous purse-string suture through the minimal incision using 3-0 poliglecaprone thread. Several knots are made to obtain a "rope" that is passed through the opposite site (at 12 o'clock), as a temporary spacer. **d** Immediate post-operative aspect

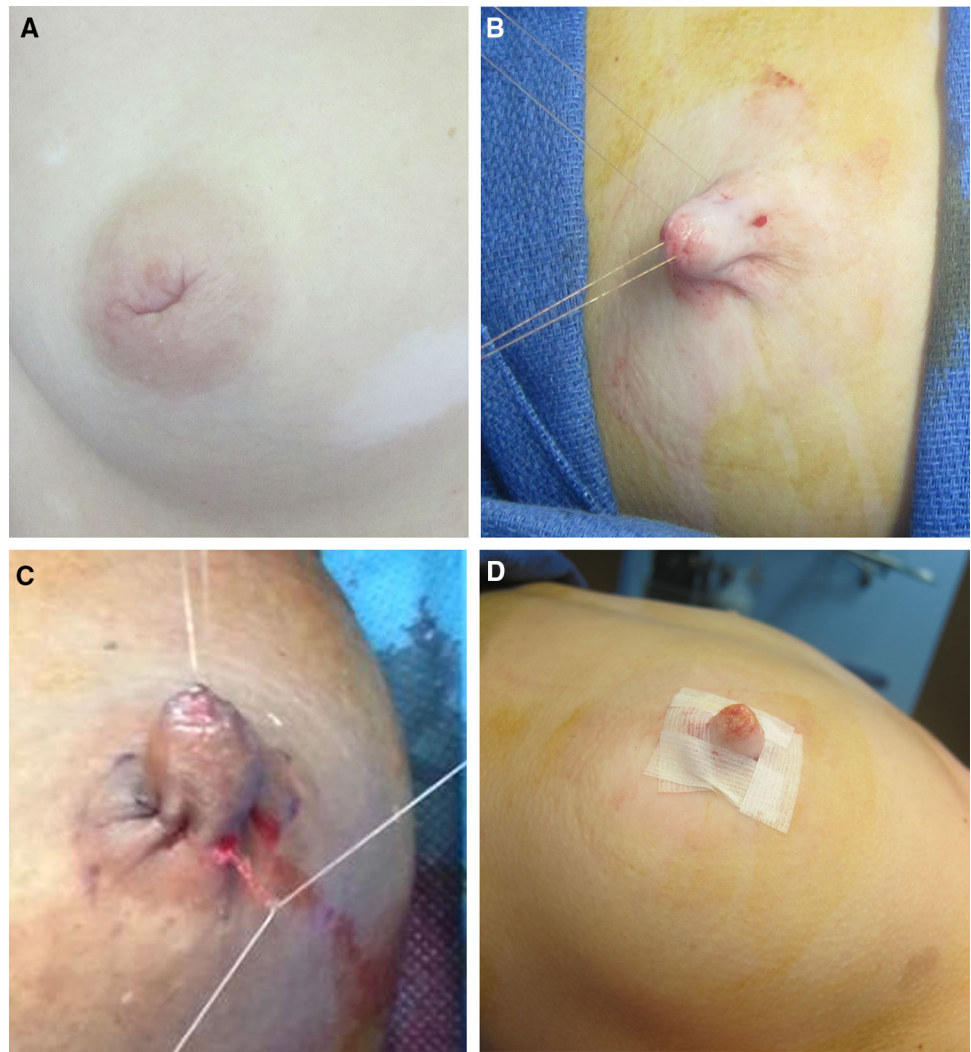
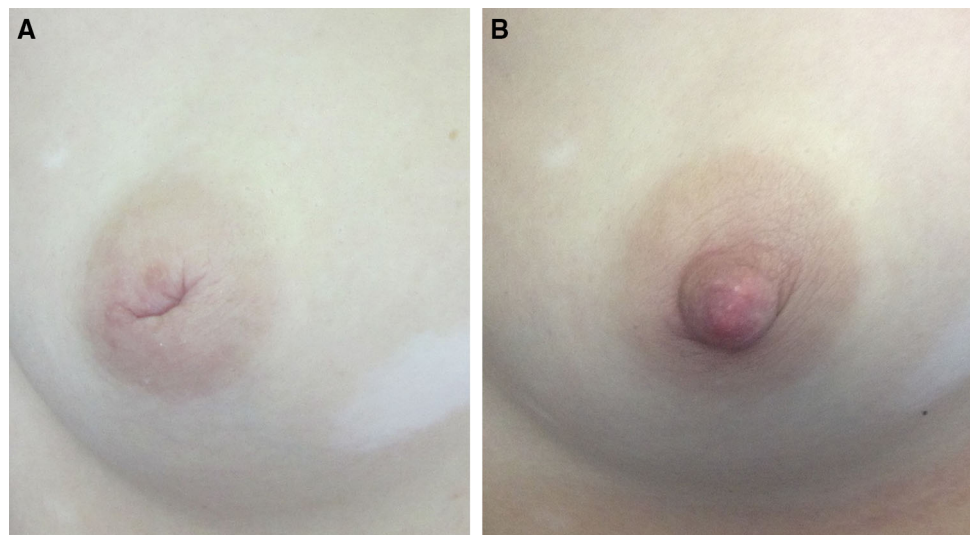


Fig. 2 27-year-old female, preoperative and 1-year post-operative aspect



After 1 year, 25 patients were examined in a follow-up evaluation. No recurrences have been observed, and all nipples maintained complete eversion (Fig. 2).

The seven patients who did not come were contacted and asked about recurrences. No recurrence was reported.

Thirty-one patients did not have immediate or delayed post-operative complications, and there was only one case of partial unilateral necrosis in a patient who underwent tumorectomy and radiotherapy.

In addition, all patients were satisfied with the aesthetic outcomes, regarding nipple projection and shape. Scars were not visible, and there were no cases of keloid or hypertrophic scars.

Discussion

For inverted nipple treatment, the fundamental principle, on which the different surgical procedures are based, consists of releasing fibrous bands and galactophorous ducts, adding bulk below the nipple and filling up the dead space created inside, to give it valuable support and avoid reinversion [17, 20].

Sakai et al. [21], Pompei and Tedesco [22], Lee et al. [23] and recently Min et al. [24] have all described different dermoglandular and dermal flaps, fat or cartilage grafts, to stabilize projection and avoid collapse.

Each technique has its own advantages, but they all require a long operative time, donor site, multiple incisions and visible scars that can cause deformity or distortion of the nipple-areolar complex, compromising the final aesthetic result.

The following approaches seems to be less-invasive, involving the use of external supports [9–12, 25, 26] (piercings, nipple's retractors, suction methods) or internal supports like alloplastic filling materials, such as silicone or polytetrafluoroethylene (PTFE) [27]. These techniques minimize scars at donor sites, but they are associated with a high risk of infection and implant extrusion [17].

Recently, Peeters et al. [7] advised the use of a poly-*p*-dioxanone (PDS) sheet, as a synthetic absorbable implant to give support and projection to nipples.

Other studies suggested performing a simple purse-string suture around the neck of the nipple, using polydioxanone dissolvable suture, in grade I inversions or a nylon permanent suture in grade II and III inversions [8]. However, the rate of recurrences remained high in severe grade inversions (27% in group II and 50% in group III) [8].

All the techniques proposed, even if they achieve good aesthetic results, are very vulnerable to loss of projection and the rate of recurrence, that is, esteemed to range from 10 to 20% [6].

Reinversion after surgical correction causes dissatisfaction and frustration in patients that often requires reoperation and loss of confidence in the surgeon [19].

The ideal technique is a simple and reliable procedure that does not require multiple incisions or special bulky dressings and is associated with minimal scars and a low rate of recurrence or sensorial disorders [28].

Our surgical technique can be used in the correction of all severity grades of nipple inversion.

Inspired by the idea of Serra-Renom et al. [17] and Peeter et al. [7] and according to many comparative studies about the tissue reaction of the different suture materials [29, 30], we proposed a minimally invasive procedure that consists of fibro-ductal tissue release through a minimal incision at the base of the nipple, followed by a percutaneous circumferential purse-string, that can be closed with several knots to make a long “rope” of poliglecaprone suture. The “rope” is used as an absorbable filler, and it is put beneath the nipple to give it sufficient bulk and to fill up the “empty” nipple.

Poliglecaprone 25 is a synthetic and absorbable monofilament suture material, composed by a polymer of caprolactone (25%) and glycolide (75%) [32]. Thanks to its favourable features, like high malleability and strength and low memory, it is used in superficial and deep tissues [29].

A lot of experimental research and clinical studies have tried to find the ideal suture, comparing the most common materials used in surgery [29–32]. They have shown how physical characteristics, biological compatibility and chemical composition of suture materials may interfere with the tissue reaction. Histological modifications of tissues surrounding the different sutures were analyzed in rat subcutaneous tissues. Poliglecaprone suture material seems to have the best biological response [30].

In vivo, 48 h after its implantation, it is possible to observe a small inflammatory reaction, with a neutrophilic infiltrate at the margins of the suture and between the fibres. It is associated with areas of connective and granulation tissue and some areas of degenerated tissue. After 1 week, fibroblastic and angioblastic proliferation is noted and collagen fibres start to organize themselves. After 2 weeks, the organization of connective tissue becomes more important: fibroblasts, collagen fibres, some foreign body giant cells and a lot of capillaries are noted. At late periods, after 20 days, the fibrous connective tissue is well organized around the suture material itself [29, 30].

In 2010 in the UK, a new synthetic polycaprolactone (PCL-1) dermal filler, called *Ellanse*TM, was introduced, designed and marketed by AQTIS Medical BV, Utrecht, the Netherlands [33, 34]. It is CE and FDA approved as an injectable implant, indicated for deep dermal and subdermal implantation, and for wrinkle correction. It is composed of smooth and spherical-shaped polycaprolactone

(PCL) microspheres (25–50 μm) [33, 35], homogeneously suspended in a tailor-made aqueous carboxymethylcellulose (CMC) gel carrier. Both PCL and CMC have excellent biocompatibility. PCL is fully excreted from the body, through normal metabolic pathways. It is a safe and totally bioresorbable polymer, usually used in orthopaedic implants, and it is the main component of bioresorbable sutures (poliglecaprone 25) [35].

Studies have shown that after its injection the CMC gel carrier is gradually resorbed by macrophages, in the meanwhile the PCL microspheres are encapsulated, as a natural body's response, and this induces a natural wound healing process, stimulating fibroblasts and neocollagenesis. All that results in an increase in soft tissue formation and so the new collagen can replace the volume of the resorbed carrier [35, 36].

According to these particular features of the ϵ -caprolactone polymer, we advise using poliglecaprone material for all severity grades of inverted nipple, like an absorbable filler, as described. The "rope", made with the same suture thread, causes an inflammatory and a foreign body's reaction, adding sufficient bulk and giving a suitable scaffold to hold up the nipple, without any other external or internal implant. Poliglecaprone hydrolysis is completed after 3 or 4 months [29], and for this reason, it can provide a continuous support to the nipple avoiding its reinversion or its collapse.

Conclusion

We have described a minimally invasive procedure consisting in a small incision followed by a fibro-ductal release and a percutaneous poliglecaprone suture that is used as a temporary spacer inside the nipple.

It is a simple, safe and cheap technique that should be considered as a reliable method for long-term correction of nipple inversion. It does not require multiple incisions and other additional costs for special implants or dressings: scars and operative time are minimal.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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