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Review Article

# Suitability of Bioabsorbable Suture Anchors in Orthopaedic Surgeries but their Formal Contraindication in TMJs Disc Repositioning Technique - Reflections and Rationale

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## Abstract

One of the most asked questions I receive from young oral and maxillofacial surgeons learning Temporomandibular Joint (TMJ) surgeries is related to resorbable bone anchors and sutures for the variety of TMJ disc repositioning surgeries, their recommendations and proprietress.

For the benefit of easy comprehension on this ultra short study sutures will be addressed separately from anchors, even though the correct term should be "suture- anchors or suture anchors" as a single unit, which are small medical devices used for fixating or attaching soft tissues (e.g. tendons, ligaments, and discs) to the bone in open and/or arthroscopic shoulder, elbow, wrist, hand and foot fingers, lower limb joints and temporomandibular joints repairs.

It is clinically essential for oral and maxillofacial surgeons to fully understand the key characteristics of existing sutures and anchors. This paper aims to summarize the current concepts on the characteristics of suture anchors for TMJ disc repositioning technique/surgery.

***Keywords:*** *Temporomandibular Joint (TMJ); Resorbable Bone Anchors; Disc Repositioning Technique*

## Brief Introduction

Mehra and Wolford (2001) [1] introduced the disc repositioning technique inserting a titanium Mitek anchor (Mitek mini anchor, Mitek Products Inc., Westwood, Mass) in the midportion of the head of the condyle as a point of anchorage for a double 0-Ethibond® suture in the medial and lateral aspects of the disc for its best fixation, covering and protecting the condyle fibrocartilage. The sutures function as artificial ligaments for disc stabilization while the major portion of the bilaminar tissue is removed accordingly with the correct technique as recommended by them.

Biocompatible implantable medical devices in the human body can be biodegradable or non-resorbable but of several natures in its composition such as: 1) hydroxyapatite, 2) calcium, phosphate and silicon materials, 3) ceramics, 4) polymers such as polyetheretherketone (PEEK), 5) polylactates and polyglycolates acid polymers, 6) alloys containing transitional metals less toxic (allergic) as titanium, niobium, tantalum, zirconium, and more toxic as zinc, chromium, vanadium, cobalt, nickel, etc [2].

Anchors and sutures used in TMJ (disc repositioning) surgery/technique should constantly coalesce two main factors which make them appropriate for its application, not only the biological compatibility but mainly their non-resorbable structure in order to fulfill the mechanical requirements for this type of surgical procedure. So, the non-bioresorbable nature of TMJ anchors and sutures are vital for long term surgery stability.

Complications of sutures and anchors may include: a) passive migration, b) loosening of sutures, c) cartilage damage as rupture, d) interference with diagnostic and/or postoperative imaging, such as computed tomography scans and magnetic resonance imaging [3,4].

Because of the TMJ origin, nature, location, and its mechanical specificity which in one aspect involves a disc anatomically seated over the most superior-anterior aspect of the head of the condyle, there sustained in position by the anterior, posterior, medial and lateral ligaments, all locked inside the articular cavity by a capsule, any suture and anchor should preferably remain permanently in position due to a slow and long term these structures take to repair, guaranteeing the success of not only the posterior disc repositioning technique but also to relocate the disc anteriorly those cases where dorsal dislocating is found through a specific surgical technique described by Stevao (2007) [5]. Another aspect is that the articular disc has a crucial role for regeneration/repair of a damaged condyle as shown by Hayashi., *et al.* (2014) [6] in their experimental animal studies. Hence the indication for these TMJ techniques as early as the diagnose is made with the magnetic resonance imaging (MRI) findings.

It is well known that several aspects are related to the success of TMJ disc repositioning such as but not limited to: a) knowledge of TMJ anatomy, b) correct diagnosis, c) proper treatment for the diagnosed TMJ disease, d) intense training in TMJ surgery for developing best surgical skills, e) profound understanding of TMJ imaginology, f) non-resorbable TMJ anchors and sutures.

## Rationale for TMJ disc repositioning non-resorbable materials

So, the question comes back again why non-resorbability is so important when TMJ disc repositioning is concerned?

The sutures used for TMJ disc repositioning technique ideally should be 0-Ethibond®/Ethibond Excell® which is a synthetic (polyester - ethylene terephthalate), non-resorbable, multifilament suture [7]. This suture does not easily rupture during knots manipulation and maintain its structure for long term. Being a rather thick suture number zero (0) and braided it helps to prevent the TMJ disc rupture when traction is placed during surgical disc pull back to its anatomical position. This rip disc apart would undesirably occur with a thin nylon suture. Ethylene would induce to fibrous formation where it passes the TMJ disc being very beneficial, reinforcing its adhesion to the disc fibrocartilage which is formed by a dense fibrous connective tissue composed 85 per cent of collagen type I per dry weight [8].

The Ethibond® sutures do never degrade but in opposition they do not osseointegrate to the condyle medullary bone, a vital factor to be considered, allowing its passage through the formed bone hole slowly repaired around the polyester material when pull-out force is applied.

After the TMJ surgery and with the weeks passing by, healing process advances, and patients start to increase the mandibular movements, mostly permitting translation of the condyle over the articular eminence and this extended movement would cause the sutures to loosely run across the bone tunnel formed around them ultimately evading the bone structure if not tied up/anchored to a non-resorbable material inside the bone.

Equally, the ideal TMJ anchor should be nonbiodegradable, osseointegrable but not necessarily metallic material. The osseointegration capacity would not allow any progressive and/or passive migration by the resorption/deposition normal bone physiology or bone remodeling cycle [9].

Even though PEEK materials show high strength, strong mechanical properties, good wear- and heat-resistance, excellent chemical and biological resistance, good postoperative imaging, stable fixation, and no complications associated with polymer degradation, the main predicament with PEEK is its poor osseointegration [10]. Nonetheless it has its application in other TMJ surgeries.

Now, if the anchor disintegrates and is resorbed away, its mechanical properties do not serve anymore for the key purpose of holding the sutures in position which will be loosened and serving of no extra support for the TMJ disc. Even though the remaining portion of the bilaminar disc is sutures back to the most posterior aspect of the repositioned disc, it has not the needed strength to hold the disc in the new position.

Independently whether the sutures or the anchor failures in its mechanical properties (non-degradability, strength, etc.), a possible relapse of the TMJ disc to the previous position found prior the TMJ surgery is a real concern for the surgeon and should be investigated as soon as the first signs and symptoms are related by the patient.

A TMJ disc relapse with the accumulation of polyester sutures on the top of the condyle possibly stationed in most posterior aspect of the articular fossa, close to the remaining portion of the bilaminar tissue, would cause formation of a membrane/capsule rich in inflammatory cells, increasing the presence of inflammatory mediators and up-regulated factors in the particular joint, increasing the MRI visible effusion, therefore promoting further destructuring of the TMJ components [11,12].

If no regular follow-ups are maintained and these conditions progress for long period of time, then the disease left by its own course will definitely condemn the joint which will demand further and more aggressive surgery under hospitalization. Physiotherapy, visco-supplementation of the diseased joint and TMJ lavage with medication delivery inside the joint will have neither indication nor any value for this condition, only increasing medical costs and patient sufferings.

## Conclusion

An ideal nonbiodegradable sutures and anchor would provide adequate mechanical fixation, have excellent biocompatibility, and decrease the prevalence of peri-anchor cyst formation. The perfect suitable non-bioresorbable sutures and anchor materials have not been invented yet.

The development of new materials for orthopaedics such as PEEK anchor to avoid insertion of transitional metals in human bodies has been an enormous advance in bone surgery [13] and it is projected that the adoption of biocomposite materials supporting osteoconductive ingrowth are the possible future in terms of bone anchors for TMJ disc repositioning.

For all these aspects above, it is essential that oral and maxillofacial surgeons understand key characteristics of a variety of currently available anchors before choosing among them.

Using the indicated and correct TMJ disc repositioning technique as described by Mehra and Wolford (2001) [1], along with the recommended and precise materials are not just essential but mandatory for not having a TMJ disc relapse and a long term success for this type TMJ surgery.

## Conflict of Interest

No potential conflict of interest relevant to this article is involved in this article nor was reported by the author.

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