

Ozone Injections in Orthopaedics: An Effective Substitute for Cortisone Injections in Total Joint Replacement Patients and Other Arthritic Conditions

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Abstract

Background: Total joint replacement (TJR) patients can suffer from tendinitis, bursitis or other inflammatory conditions that are generally treated by cortisone (corticosteroid) injections. Such injections rarely cause complications in the general public, but have resulted in severe implant infections in some patients with joint replacements. The purpose of this study is to review the literature involving joint replacement infections after cortisone injections and present ozone as an alternative to cortisone in a series of joint replacement patients with periarticular inflammatory conditions. **Methods:** There were 26 combined patients with either total hip replacement (THR), total knee replacement (TKR), total ankle replacement (TAR), or resurfacing shoulder replacement (SR) that developed tendonitis, bursitis or inflammatory problems related to their respective joint arthroplasties. Rather than use cortisone, they were given prolozone injections into the inflammatory regions to relieve them of their pain and dysfunction. This injection was followed by an ice pack for one hour and a return to normal function thereafter. **Results:** All THR, TKR, SR and TAR pathologies were improved or asymptomatic after one or a series of prolozone injections into the area of inflammation. No cortisone injections were used and no infections were encountered. **Conclusions:** Prolozone injection therapy is an effective treatment for post-operative inflammatory conditions following total joint replacement. Patients find relief of inflammation symptoms, similar to steroid injections, without the risk of infection or tissue breakdown. Prolozone injection therapy can be useful when conventional injection treatment fails, or is contraindicated.

Keywords

Ozone Gas, Prolozone Injections, Total Joint Infections, Cortisone

1. Introduction

Anti-inflammatory, cortisone (corticosteroid) injections are routinely used in orthopaedic practice to treat bursitis, tendonitis, fasciitis and other inflammatory conditions that have been unresponsive to heat/cold, massage or rest. Infections after proper, sterile technique injections are unusual in the general population. Reports of devastating joint replacement infections have been described after standard cortisone injections pre-operatively and post-operatively [1]-[4]. Management of these severe infections usually requires a staged revision surgery and removal of the primary implants [5]. This complex surgery can be followed by further serious complications of pulmonary embolism, re-infection or possibly death [6].

Ozone has been used successfully in medicine for more than a century [7]. In fact, Nikola Tesla patented the first ozone generator in 1896 [8]. Since the development of steroids, antibiotics and pharmaceuticals, the use of ozone has been marginalized or forgotten as an effective treatment for infections, inflammation and chronic diseases.

Recent re-introduction of the benefits of ozone gas in various concentrations (micrograms per milliliter, formally gamma) has emerged [9]-[12]. The routes of administration have varied with the sites of inflammation, namely, mucus membranes, blood, joints, bursa, fascia, tendons or ligaments. Direct blood infusions with ozonated blood that is drawn, then ozonated and re-infused, is called major auto hemotherapy (MAH), a technique successfully used for chronic autoimmune disorders. Rectal, vaginal, ear, nasal or bladder insufflation with ozone gas has been used to control chronic infections [13]. Prolozone [14], the subject of this study, uses pre-injection anesthetics and homeopathic medications injected through a small bore (25 gauge) needle, followed by ozone gas through the same needle into a joint, bursa or painful trigger point to effect immediate relief that can last for days, months or years, depending upon the nature of the inflammation. A series of these prolozone injections may be needed in stubborn or chronic inflammatory conditions to maintain control.

This study explores the use of prolozone injections in post-operative inflammatory problems encountered in a variety of joint replacement applications usually treated by cortisone injection therapy.

2. Methods

Of the 26 combined patients in this cohort, there were 8 THR patients that developed severe trochanteric bursitis; 8 TKR patients that developed pes anserinus bursitis, medial collateral ligament (MCL) inflammation, quadriceps or patella tendinitis; 8 TAR patients that developed MCL, lateral collateral ligament (LCL) inflammation or posterior tibial tendinitis (PTT) and 2 SR patients that developed

biceps tendinitis.

All patients received one or a series of prolozone injections into the region of inflammation at biweekly intervals, as needed. The pre-injection medications for each injection was comprised of: Procaine 2% 2.5cc, Trameel 1cc, Engystol 0.5cc and Lymphaden 1cc delivered through a 25 gauge needle after an alcohol preparation, an Ethyl Chloride cold spray (Gebauer Co. Cleveland, OH), followed by 20 cc of Ozone gas from the Quantum 5 Ozone Generator (Longevity Resources, B. C., Canada) at a concentration of 20 $\mu\text{g}/\text{ml}$ delivered through the same 25 gauge needle (see **Figure 1** & **Figure 2**). An example of an injection sequence for trochanteric bursitis of the right hip is shown in **Figure 3**.



Figure 1. Quantum 5 ozone generator connected to an oxygen tank.

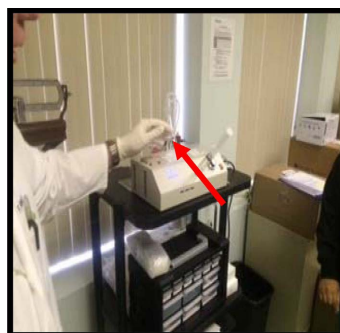


Figure 2. Syringe filled with 20 cc of ozone gas (20 $\mu\text{g}/\text{ml}$) (red arrow).

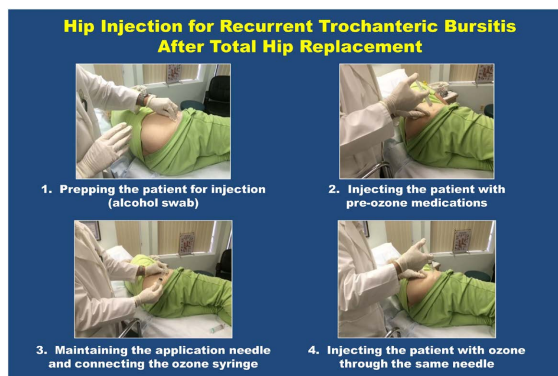


Figure 3. Injection sequence for a patient with Trochanteric Bursitis of the right hip after a THR.

Patients with either THR, TKR, TAR, or SR developed tendonitis, bursitis or inflammatory problems related to their respective joint arthroplasties. Rather than use cortisone, they were given prolozone injections into the inflammatory regions to relieve them of their pain and dysfunction. This injection was followed by an ice pack for one hour and a return to normal function thereafter.

Prolozone injections are also effective in major arthritic joints such as the knee, shoulder and ankle, but less effective in the hip. An injection sequence for left knee osteoarthritis suffered by the author, which gave excellent results over a three year period, is shown in **Figure 4** and **Figure 5**.

3. Results

The summary of pre and post-op treatment pain scores are shown in **Figure 6**. The summary of “Trigger Points” injected and the outcomes are shown in **Figure 7**.

All but one patient had improvement in their inflammatory symptoms. One of 8 THR patients failed to have lasting relief from her prolozone injections for recurrent, chronic trochanteric bursitis and required surgical bursectomy to gain relief. Another patient (TKR) with recurrent, chronic pes anserinus bursitis continued to have mild/moderate pain after multiple injections, but not enough to warrant surgical bursectomy. Ankle and shoulder patients had excellent pain relief after a series of prolozone injections. No other complications were encountered and no infections were seen in this cohort of patients.

4. Discussion

The fact that ozone is a sterilizing agent, [15]-[17] precludes it from causing an infection, and makes it an ideal candidate for an injectable substance to treat subdermal inflammatory conditions such as bursitis, tendinitis, fasciitis, sprains and strains that don't respond to non-injectable alternatives.

Aside from extra-articular benefits, ozone is also quite effective as an intra-articular treatment for advanced arthritis [14] [18], such as osteoarthritis (see **Figure 4** and **Figure 5**). It has been shown to have lasting effects for years, before joint replacement surgery is ultimately needed [14].



Figure 4. Standing AP X-rays of the left knee in a 77 year old male orthopaedic surgeon demonstrating osteoarthritis of the medial compartment.

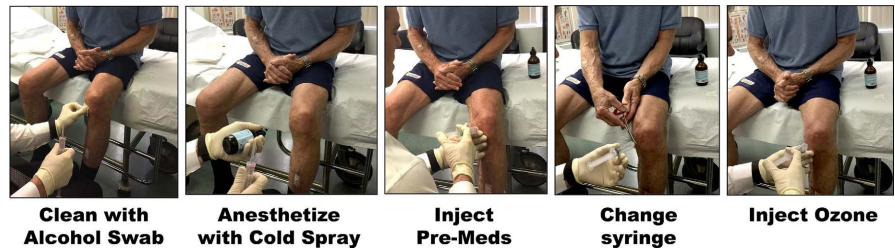


Figure 5. Prolozone injection for painful left knee osteoarthritis of the medial compartment in the same patient as **Figure 4**.

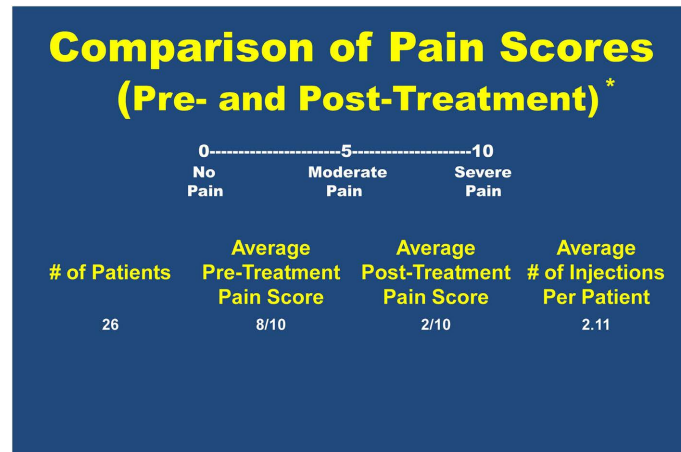


Figure 6. Comparison of pre and post prolozone injection pain scores.

Summary of TJR “Trigger Points” Injected*

Joint Replaced	Total # of Patients	Anatomic Site (# of Patients)	Total # of Injections	Patient Outcome			Infections
				Good	Fair	Poor	
Hip	8	Trochanteric Bursa (8)	12	8	0	1	0
Knee	8	Pes Bursa (5)	14	4	1	0	0
		MCL (1)	2	1	0	0	0
		Patella Tendon (1)	1	1	0	0	0
		Quad Tendon (1)	1	1	0	0	0
Ankle	8	MCL (6)	13	6	0	0	0
		LCL (1)	2	1	0	0	0
		PTT (1)	2	1	0	0	0
Shoulder	2	Biceps Tenodesis (2)	5	2	0	0	0

Figure 7. Summary of “trigger points” injected with prolozone.

Over a seven year period (2015 - 2022), the author has personally had success with prolozone injections in the following conditions: OA or PTA of the ankle; OA of the shoulder; OA of the knee; Trochanteric bursitis after THR; Subdeltoid bursitis after TSR; Biceps tendinitis after TSR; Chronic low back pain; Chronic sinusitis; Ankle ligament inflammation after TAR; Periarticular tendinitis of the ankle after TAR and painful scars. Other than occasional, temporary injection site redness, no specific complications were seen. This observation is in contrast to the

significant risks associated with corticosteroid injections prior to, or after, TJR surgery. For instance, steroid injections within 3 months of THR can be attributed to a 36% increased risk of post-operative infection [1], while the rates of surgical site infection were 22% higher in patients with an injection within one year prior to TKR than those without [2]. Additionally, in a study of 58,337 patients undergoing TKR, it was found that preoperative corticosteroid or hyaluronic acid injections given less than 3 months before surgery increased the risk of periprosthetic joint infection by 19% and 53%, respectively [3]. Also, in a study of 635 patients with TKR's, 3 patients became infected within 3 months after an intra-articular corticosteroid injection, an infection rate of 0.16% per injection [3].

Considering the huge cost burden of revising infected TJR's (\$1.63 Billion in 2020) [4], the use of corticosteroid or hyaluronic injections prior to or after surgery should be avoided or used with extreme caution. It appears that ozone injection therapy for these inflammatory conditions minimizes or eliminates these risks and should be seriously considered.

5. Conclusion

Prolozone injection therapy is an effective treatment for post-operative inflammatory conditions following total joint replacement. Patients find relief of inflammation symptoms, similar to steroid injections, without the risk of infection or tissue breakdown. Prolozone injection therapy can be useful when conventional injection treatment fails, or is contraindicated. It is also useful in major joint arthritic conditions prior to or often in place of joint replacement surgery.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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