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Case Report

Gold-Induced Cytokine (Goldic®) – A Promising Treatment in Patients with Grade 4 Knee Osteoarthritis: A Case Study

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Abstract:

Background:

Knee osteoarthritis (KOA) is one of the most common degenerative diseases that can lead to disability and pain. The degenerative nature of this condition cannot be reversed or healed by any currently available treatments.

Recently, there has been an upcoming interest in treating degenerative tissue disorders with minimally invasive autologous blood products. Autologous blood was preconditioned with gold particles to encourage the production of various proteins in patients' blood.

This current study investigated the safety and efficacy of pre-conditioning autologous blood with gold particles (GOLDIC®) in patients with severe knee osteoarthritis (KOA).

Case presentation

We report a case in which four intra-articular GOLDIC® injections were used to treat knee osteoarthritis. After a week, physiotherapy was recommended. Before and three weeks after the injections, she was assessed for her weight, the Visual Analog Scale (VAS), and the Western Ontario and McMaster University Osteoarthritis Index (WOMAC) score.

GOLDIC® treatment resulted in significant weight, VAS, and WOMAC score improvements without serious side effects.

Conclusion

Due to the one-time blood harvesting and only four injections, the initial results demonstrated that the treatment plan is safe, less expensive, patient-friendly, and more successful at achieving compliance. This GOLDIC® treatment can significantly decrease pain and improve knee capability with overall satisfaction over a significant period.

To fully validate the real potential of GOLDIC® in heterogeneous patient populations and to compare these promising results to other blood-based platforms, future randomized-controlled trials with long-term follow-up are required, despite the promising early clinical results.

Key words: knee osteoarthritis; goldic; intra-articular injection; vas; womac

Introduction

Over 10% of the world's population is thought to suffer from knee osteoarthritis (KOA) [1, 2], with a 45 per cent lifetime risk [2, 3]. Biologics like Platelet-Rich Plasma (PRP), mesenchymal stem cells, or conditioned autologous serum are becoming more common due to increasing demand for alternative non-surgical KOA management [4].

The GOLDIC procedure was developed to combine autologous blood therapy's advantages with gold's enhanced therapeutic effects on the cellular level [4]. Ulrich Schneider introduced GOLDIC (gold-induced cytokines) in 2014. Arthrogen GmbH (Germany) was the company that developed and introduced GOLDIC therapy [5].

When compared to other blood-based biological methods, the GOLDIC® is an anti-inflammatory technology that has important growth factors and stem cells factors of plasma gelsolin (pGSN), Granulocyte colony-stimulating factor (G-CSF) and Hematopoietic stem cell growth factor-beta (SCGF-ß). All of these are upregulated, and these combinations are known to play an essential role in tissue repair and regeneration by using the phenomenon of anti-inflammatory cytokine proliferation that occurs during a prolonged incubation of whole blood in tubes coated with gold particles [6]. This therapy has positively affected patients with moderate to severe osteoarthritis in a preliminary phase 2a open-label study [6, 7].

In this study, we investigate the outcome of locally administrated gold-activated autologous serum treatment in a 60-year overweight female patient with bilateral knee osteoarthritis.

Case presentation

A 5-feet woman, 60 years old, presented with a diagnosis of grade-4 bilateral chronic knee osteoarthritis pain for the past eight years. She was non-diabetic, obese (105 kg), and had hyperproteinemia.

The patient was recommended non-invasive GOLDIC® injections for her bilateral knee pain. Regarding GOLDIC® and its use in knee osteoarthritis, including the potential risks involved, written information and proper education regarding pre- and post-treatment were provided. She was evaluated as a suitable candidate for the ultrasound-guided GOLDIC® aseptic administration trial because she already had grade-4 bilateral knee osteoarthritis and had not responded to conservative treatment. Before beginning GOLDIC® treatment, the patient provided formal written informed consent.

GOLDIC® Preparation & Administration

GOLDIC®-conditioned serum was prepared according to the procedure given below.
Briefly, 4x10 mL of the patient's venous blood was directly collected into designed GOLDIC® syringes for each treatment without adding anticoagulant or other additives. The patented GOLDIC® syringes include the designed gold particles and a special filter to prevent these designed gold particles from entering the patient's body along with the processed serum.

The syringes were then capped and incubated at 37°C for 24 hours. These syringes were then centrifuged, and the plasma was separated. A total of 8 syringes were made, each of 3-4ml of processed plasma. Two plasma injections were initially given, and the remaining six syringes were stored at -20°C. The patients were then given the resultant GOLDIC®-treated plasma again at every session [8].

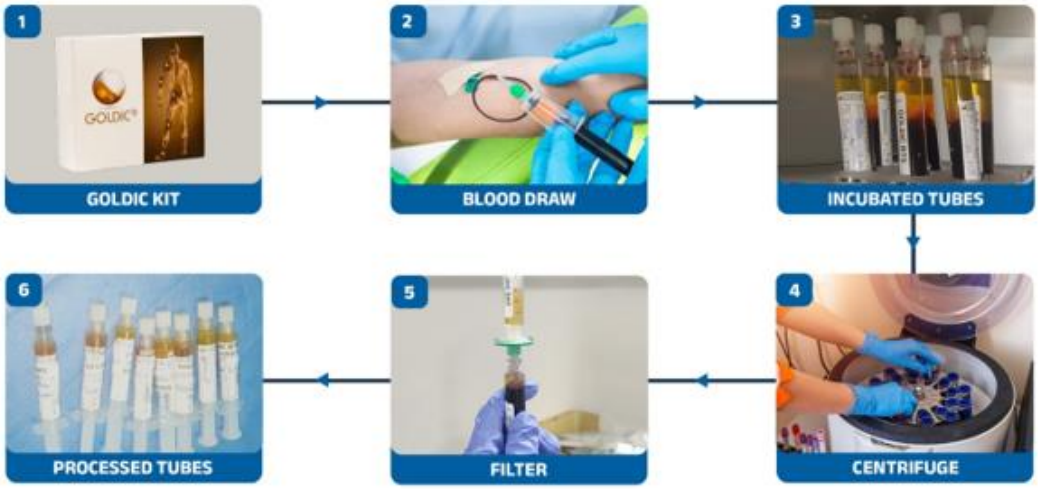

Figure 1: GOLDIC injection preparation

At intervals of 2 to 15 days, the patient received four intra-articular USG-guided GOLDIC® injections to bilateral knee joints. The entire procedure was carried out aseptically.
During GOLDIC® treatment, there were no significant complications or adverse events reported. However, the patient was instructed to use an ice pack or cold therapy at home for any knee pain and to refrain from standing or walking for 24 hours following the injection. In addition, she was instructed to strictly avoid non-steroidal anti-inflammatory drugs (NSAIDs) and take only one gram of paracetamol four times per day for post-injection pain.
After the third injection, physiotherapy rehabilitation was recommended for three months, including strength training, a weight loss plan, lifestyle change, and an anti-inflammatory diet. She was, however, instructed to avoid strenuous exercise.

The pain and functional outcome were assessed before the first GOLDIC® injection and after 12 months, using validated outcome measures like Visual Analogue Score (VAS) and WOMAC.

Result

The patient experienced rapid improvement in pain and function following GOLDIC therapy.
The VAS pain score improved from 9 out of 10 to 1 The WOMAC scores at baseline indicated significant functional impairment (76 (R) and 81 (L)). The patient was experiencing more pain in the left than in the right. After twelve months of the GOLDIC® injection, the WOMAC score reached (17 (R) and 23(L)). Both these scores improved rapidly and indicated no functional impairment until the completion of 3 months (Table 1). The overall weight reduced from 105 kg to 95 kg after nine months. No significant adverse events were noted throughout the follow-up.

Scores	Pre-GOLDIC	Post-GOLDIC 3 months	Post-GOLDIC 12 months
VAS score	9	7	1
WOMAC score	76 (R) 81 (L)	46 (R) 57 (L)	17 (R) 23 (L)
Weight	105kg	99 kg	95 kg
Diet change to an anti-inflammatory weight loss diet			

Table 1: Score Evaluation

Discussion

The treatment of osteoarthritis with autologous blood products is not new. Platelet-rich plasma (PRP), autologous conditioned serum (ACS), and autologous conditioned plasma (ACP) preparations have been utilized with varying degrees of success for a few decades. It has also been demonstrated that the effect of PRP can last anywhere from six months to one year. The inconsistency of the outcomes may be attributed to the absence of a standard procedure for PRP preparation, Variable types, additional factors like gamma interferon, the number of PRP injections, and the number of sites The GOLDIC® serum's content and quality are consistent due to the standardization and uniformity of the preparation method, which sets it apart from PRP [9].

Gold compounds have been used in medicine for a long time, especially to treat rheumatoid arthritis and tuberculosis. Gold is frequently used in osteoarthritis treatment, such as in joint implants or acupuncture [11]. However, there has always been a toxicity issue, which has led to a decline in their use to this day. The benefits of gold compound therapy without the associated side effects have been made possible by introducing autologous, closed-processing GOLDIC® technology, in which no gold compounds are re-administered to the patient, and all the particles are filtered out during the processing stage.

In previous studies, the intra-articular GOLDIC® injection increased local gelsolin (GSN) levels is particularly intriguing [9]. It is well known that free or extracellular actin can slow down the activity of macrophages, allowing infections to spread faster and more rapidly. Importantly, plasma gelsolin (pGSN) can bind to actin and cleave it, thereby reversing or minimizing these negative effects [6].

In the GOLDIC procedure, a lot of pGSN, an action-depolymerizing protein, was Synthesised. This makes it easier for damaged tissue, joints, or spinal canal stem cells to migrate and become activated. The production of pGSN protects the cell from degeneration and damage and is linked to an increased risk of cellular apoptosis. Gelsolin also controls essential cell functions like cell motility, phagocytosis, apoptosis, and the activation of thrombocytes. Its plasma concentration is reduced in various degenerative tissue diseases [9].

Granulocyte-colony stimulating factor (G-CSF), which can stimulate the bone marrow to produce granulocytes and stem cells that are released secondarily into the bloodstream, is another equally important product of incubation on gold particles [5].

By employing the GOLDIC® technology, essential growth factors and stem cell-specific factors, such as gelsolin, G-CSF (granulocyte-colony stimulating factor), and SCGF-ß (hematopoietic stem cell growth factor - beta) are enriched to a significant high degree, compared to other regenerative treatments. This increased production of gelsolin, G-CSF, and SCGF-ß in patients amounts to a multiple of the initial concentration. The administration of gold-activated autologous serum may have the effect of changing the body's disease environment and harnessing the serum's immunomodulatory and anti-inflammatory properties for regeneration [8]

In-vitro examinations have shown that brooding with gold particles hinders catabolic variables, increments hostile to catabolic and anabolic elements, expands the degree of gelsolin, a critical protein in cell digestion, and helps in reestablishing the general joint homeostasis [9, 10]. Although the precise mode of action of the GOLDIC procedure has yet to be well established [9], it proves to be an effective non-surgical treatment method against knee osteoarthritis.

Conclusion

GOLDIC® technology was considered the quick and supported therapeutic upgrade in all patients as it does not cause severe unfavorable outcomes. As a result, the study of GOLDIC® was suggested as a conservative approach to managing severe KOA.

To better assess the effects of treatment, qualitative and quantitative MRI results, PROMs (Patient-reported outcome measures) in relation to PASS (patient acceptable symptom state), and JSW (joint space width) on plain weight-bearing radiographs were planned for subsequent investigations.

To fully validate the real potential of GOLDIC® in heterogeneous patient populations and to compare these promising results to other blood-based platforms, future randomized-controlled trials with long-term follow-up were required, despite the promising early clinical results.

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