Topical Drug Delivery in Patient With Renal Impairment: Sinus Lifting and Installation of Two Implants

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Abstract
The surgery for lifting of the maxillary sinus is indicated in cases of bone resorption of the alveolar process of the posterior maxilla, which may limit the placement of implants with appropriate lengths. However, many patients need surgery for oral rehabilitation for both aesthetic and functional reasons, but there are numerous restrictions on medication before and after surgery. This case report is regarding the surgery for sinus lifting and installation of two implants in a patient with renal impairment, unable to receive conventional medication for pre, during and post-surgery. Topical doxycycline gel nanotubes, broad spectrum antimicrobial, and a modulator of the inflammatory response, was adopted as a drug substitute. The patient showed no postoperative complaints and the surgery was judged as satisfactory.

Keywords
Drug distribution; Metabolism; Antibiotics; Anti-inflammatory

Introduction
The alveolar process of the maxilla and mandible undergo reabsorption after the removal of tooth roots or as a result of neoplastic, traumatic or infection lesions [1]. The surgery for lifting the maxillary sinus is indicated in cases of bone resorption of the alveolar process of the posterior maxilla, which may limit the placement of implants with appropriate lengths [2]. However, many patients need surgery for oral rehabilitation, both aesthetic and functional, but there are numerous restrictions on medication before and after surgery. For example, chronic kidney disease affects renal drug elimination and other pharmacokinetic processes involved in drug disposition, such as absorption, drug distribution, metabolism and elimination [3].

Topical antibiotics have certain benefits such as high concentrations, topical application and persistence in place since physiological changes in the region may compromise the efficacy of systemic antibiotics [4].

Another very important advantage is the low systemic absorption and low toxicity, which consequently reduces the intake of systemic antibiotics and, invariably, the possibility of developing a systemic side effect [5].

Studies have shown that delivery topical doxycycline can be associated with non-surgical periodontal treatment [6], according to their anti-inflammatory and antibiotic effects [7].

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In patients with systemic commitments and unable to receive conventional systemic medication, topical doxycycline offers anti-inflammatory and antibiotic properties necessary for the completion of treatment.

This case report on the surgery for sinus lifting and installation of two implants in a patient with renal impairment, unable to receive conventional medication for pre, during and post-surgery.

Case Presentation

Patient A. K. A. C., caucasian, born on date 05.12.1932 at anamnesis revealed a history of renal impairment. After consulting a nephrologist, the recommendation was not using antibiotics and conventional anti-inflammatories to avoid overloading the patient’s renal function. We opted for the medication that made possible the realization of surgical procedures, guaranteeing a satisfactory postoperative renal function without compromising its already weakened.

Topical doxycycline gel nanotubes, broad spectrum antimicrobial, and a modulator of the inflammatory response, was adopted as a drug substitute.

We performed sinus lift surgery for the patient and the installation of two implants supporting Schneider membrane to subsequently apply the loads (prostheses) [Figure 1]. During the trans-surgical phase, the patient was treated with doxycycline gel nanotubes, inserted locally in the whole extension of the surgical site [Figures 2, 3 and 4]. The only medication prescribed was sodium dipyrone 6 in 6 hours for the first 48 hours, but there was no need to use all doses.

The patient returned in 3 days after for follow-up surgery, and on the seventh day the sutures were removed. Clinically, the area presented with good healing and was free from infection. The patient showed no postoperative complaints and the surgery was judged as satisfactory. The patient is still waiting period required for receiving prostheses.

Discussion

The definition of chronic kidney disease is the presence of kidney damage or a reduction in the glomerular filtration rate for three months or longer [8]. In particular, older patients are at a higher risk of developing advance disease and related adverse events caused by age-related decline in renal function and use of multiple medications to treat comorbid conditions [3].

Here, we report the case of a patient with renal impairment who needed surgery for lifting of the maxillary sinus, but after consulting a nephrologist was recommended not to use antibiotics and conventional anti-inflammatories.

The clearance of many drugs and their metabolites depends on adequate renal function. Renal clearance is especially important for some drugs where the gap between efficacy and toxicity is narrow [9]. Furthermore, some antibiotics that are eliminated renally, may be associated with systemic or renal toxicity. For example, excessive serum levels of injectable penicillin G or carbenicillin may be associated with neuromuscular toxicity, myoclonus, seizures or coma. Imipenem/cilastatin can accumulate in patients with chronic kidney disease, causing seizures. Tetracyclines, with the exception of doxycycline, have an anti-anabolic effect that may significantly worsen the uremic state in patients with severe disease. Nitrofurantoin has a toxic metabolite that can accumulate in patients with chronic kidney disease, causing peripheral neuritis [3]. Analgesics, such as morphine, tramadol and codeine can accumulate in patients with chronic kidney disease, causing central nervous system and respiratory adverse effects. Adverse renal effects of nonsteroidal anti-inflammatory drugs (NSAID) include acute renal failure, nephritic syndrome with interstitial nephrits and chronic renal failure with our without glomerulopathy, and papillary necrosis. The risk of acute renal failure is three times higher in NSAID user than in on non-NSAID users [3, 10].

Considering what has been explained above, we decided to use topical delivery doxycycline gel nanotubes. The members of the tetracycline family of antibiotics possess the ability to inhibit matrix metalloproteinases, independently of their antimicrobial activities. Doxycycline was found to be a potent inhibitor of matrix metalloproteinases [11]. Thus, it is able to modulate the inflammatory response. Other benefits include the limited potential for systemic absorption and toxicity, reduced volumes of antibiotic use, and, possibly, less potential for the development of antibiotic resistance [12].
Conclusion

This case suggests that the use of doxycycline gel in patients with systemic limitations does not impede or limit the surgical procedures necessary for the oral rehabilitation as sinus elevation and implant placement, fulfilling the antimicrobial function and anti-inflammatory, allowing comfortable postoperative without interfering with the patient’s oral microflora and may even reduce costs.

Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

Reference


