Our previous studies demonstrated that the use of acrylic based prosthesis in edentulous patients had a direct impact on the increased incidence of oral mycosis and further episodes of mycosis in the digestive tract. This dependency is associated with formation of a space between the surface of the prostheses and adhering mucosal membrane, where a specific micro environment is being formed, which - as stated - creates a superior breeding ground mainly for microorganisms of the genus Candida.

Key words: complete denture, denture stomatitis, edentulous mouth, gastrointestinal endoscopy

INTRODUCTION

In the prosthetic treatment of edentulous and partially edentulous patients, acrylic based prosthesis are most commonly used. Our previous studies (1-3) clearly demonstrated that the use of these types of prosthetic devices had a direct impact on the increased incidence of oral mycosis and further episodes of mycosis in the digestive tract. In particular, the existence of mutual dependence Candida infection in the mouth and throat was confirmed (1). In edentulous patients this dependency is associated with extensive plate prostheses and the consequential formation of a space between the surface of the prostheses and
adhering mucosal membrane. Within this space a specific micro environment is being formed, which - as stated - creates a superior breeding ground mainly for microorganisms of the genus *Candida* (1, 4-9). Therefore, the oral cavity can be considered as a potential reservoir for gastrointestinal infection and re-infection. It was found that the factors that foster the growth of microorganisms under slabs of acrylic prostheses are: increased temperature and pH of the environment, material Alba and underlying epithelium, microaerophilic conditions and lack of self-cleansing saliva, microscopic imperfections or defects in the acrylic plastic, disease and systemic neglect in oral hygiene. These conditions are conducive to changing the quantitative and qualitative presence of oral microorganisms, of which, a significant increase in the number of yeast-like fungi and the accompanying use of mechanical prostheses trauma, can be regarded as the most important factor in the etiology of pathological development in the lining of the denture supporting area, known as "stomatitis prothetica mycothica" (10-14).

These assumptions, and the results of implant-prosthetic treatment (9, 15-18) as a corollary that it is possible to eliminate the plate prostheses, have become the basis for developing a specific protocol - namely - the elimination of the causes of the infectious states observed in practice. The thesis was to undertake a study into the assumptions that the introduction of clinical procedures that result in the elimination or substantial reduction of plate prostheses will improve oral health and reduce the risk further episodes of fungal infection in the digestive tract.

The goal of this work was a diagnostic and therapeutic procedure using implant-supported dental prosthesis as a preventive therapy for *candidiasis* of upper gastrointestinal tract in the edentulous patient.

**MATERIALS AND METHODS**

This study was conducted among twenty edentulous patients (aged 40-70 years) who are users of complete acrylic dentures and who have been diagnosed with extensive inflammation of the mucosa. The study was approved by the appropriate Institutional Review Committe at the Jagiellonian University Medical College, Cracow, Poland (No. KBE/103/B/2004) and all subjects gave written informed consent to participate prior to inclusion. The research methodology included a series of clinical and laboratory mycological tests. Interviews, general clinical examinations and local oral examinations were supplemented with endoscopy of the esophagus. In 10 cases, laboratory tests included specimens collected from both the mouth and the esophagus. Clinical evaluation included an assessment of the denture supporting area and the state of prosthetic additions, while symptoms of the gastrointestinal tract were initially ascertained in the interview process. All patients involved had radiological survey to assess the state of bone and dental alveolar destruction. Swabs collected for mycological testing were taken from the lining between the first and second mucosal fold on the palate.

Precautions taken were generally adopted requirements relating to the collection of material to prepare a field study, *i.e.* volume and number of samples, preparation of the material for transportation to the microbiology lab and the observation of standard precautions required while working with potentially infectious material.
The assessment criteria, defined as: an increase in mycological quantity, a very ample (water catchment), or an average mycological quantity with simultaneously occurring dyspepsia discomfort, was the basis for carrying out further gastroenterological research. These assessments were made during the clinical evaluation and analysis of material collected from the lining of the esophagus. In ten of the twenty patients studied the full application of diagnostic-therapeutic procedure was performed; in these cases there was reasonable suspicion of the simultaneous occurrence of a mouth and esophagus candidiasis.

After the completion of antifungal treatment (consultation with a gastroenterologist and microbiologist took place), the implant-supported dental prosthesis were performed to eliminate the original acrylic prosthesis recorded as favoring Candida infection. After completing the implant-prosthetic treatment a re-examination by a gastroenterologist and microbiologist was completed.

RESULTS

Diagnostic and therapeutic case study of a 63 year old patient using complete dentures for a period of 13 years

The patient reported complaints of the mouth and gastrointestinal tract. A clinical examination found inflammation of the lining of the palate and floor of mouth from the upper and lower prostheses. According to the established protocol the study focused on complications of the gastrointestinal tract and a detailed assessment of the prosthetic used coupled with an assessment of the denture bearing area. The interview revealed information of the condition persisting for several years and the periodically recurrence of dyspeptic symptoms. The patient wore prostheses 24 hours a day, did not use dental adhesive, and oral hygiene and dental prostheses care was not regularly performed. The primary reason for the patient's seeking treatment was the digestive tract symptoms and soft, white elevated raids covering mucosal part of

Fig. 1. Intraoral view: The white elevated plaques covering mucosal part of the palate distally, as well as on the periphery of disc prosthesis border
the upper plate prostheses. The intraoral survey found that dental alveolars were partly vanished, and the mucosa of the denture bearing area showed characteristic inflammation covering the range of the CD prostheses. There were also white locale raids on the mucous membrane of the alveolar and distal parts of the palate, as well as on the periphery of disc prosthesis border - especially towards the border of the soft palate (Fig. 1).

A palate swab was taken, in order to carry out the mycological study, which showed increased growth of Candida albicans in the oral mucosa of our patient. This was followed by endoscopic examination. With material taken from the lining of the esophagus, where it was found to be widespread, many fungal raids of Candida albicans were cultured on petri plates (Fig. 2) at the level of growth abundant and very abundant. Lastly, an antibiotic sensitivity test was performed against the fungal material collected from the mouth and esophagus. Essential antibiotics used to treat fungal infections were investigated, in vivo nystatin,
Pimarin, amphotericin B, 5-fluorocytosine, clotrimazole, miconazole, ketoconazole, tioconazole, fluconazole and itraconazole.

Prior to further prosthetic proceedings, the denture supporting area with biological tissue material was reconstructed (using Mollosil), and after confirmation of fungal sensitivity, local nystatin in suspension and systematically acting fluconazole via syrup were administered for fungal eradication.

Ultimately, the patient was scheduled for elimination of the original acrylic prosthetic in favour of a permanent prosthetic addition, such as implant dentures.

Treatment by the implant-prosthetic was implemented in two stages. In the first stage teeth in the mandible were reconstructed, six implants were set in and a circular implanto-bridge was applied (Fig. 3 AB). In the second stage eight implants in the maxilla were placed with two implanto-bridges (Fig. 4 AB, Fig. 5 AB).

Mycological testing was performed again to verify the presence or absence of fungal infection following treatment. Complete eradication of the mycological infection resulted in a reduction in the inflammation of the mucosal lining of the mouth, as well as previously reported dyspeptic ailments. In a three-year

![Fig. 4. The second stage of implanto-prosthetic treatment:](image1)
A - radiological survey taken after placing 8 implants in maxilla
B - intraoral photograph taken after osseointegration of implants in maxilla

![Fig. 5. Intraoral photograph after the complete treatment:](image2)
A - implanto-prosthetic reconstruction in mandible and maxilla
B - the photograph of the palate after complete treatment. After eliminating the plate prostheses with implant-supported dental prosthesis the inflammation of the mucous
observation period, we did not identify a relapse of infection in the mouth, which also correlated with the resolved symptoms of the gastrointestinal tract.

Similar diagnostic and therapeutic protocol was performed with the remaining nine patients, yielding similar results.

**DISCUSSION**

Patients using acrylic plate prosthesis exhibit the reservoir of microorganisms, recognized as potentially pathogenic organisms for the digestive tract. Following mycological testing, fungal infection was discovered with the genus *Candida albicans*, whose main living area in the oral cavity is a space of mutual adherence between the prosthetic plate and the mucosal membrane. Based on laboratory findings and endoscopic examinations of 10 cases with identified inflammatory states on the lining of the mouth and throat, the mycosis was diagnosed with symptoms of chronic mucosal inflammation with or without erosions. This means that the state of inflammation of the lining of the mouth against the background of mycotic infection (stomatitis prothetica mycotica) was in these cases connected with the same candidosis recognized by the esophagus.

In addition, results obtained from clinical trials, as well as mycological and gastroenterological findings have confirmed the merits of the application developed by the authors for the diagnostic and therapeutic proceedings in cases where the spark changes in the oral cavity of patients using prosthetic pieces are strongly associated with dyspeptic history and accompanied by symptoms of the gastro-intestinal tract. In particular, it was found that treatment with implant-supported dental prosthesis, while eliminating moving prostheses, was an effective method for the prevention of fungal infection in the mouth and throat.

Our study has confirmed earlier reports by authors (10-14) that edentulous patients using total acrylic prosthesis present with a yeast-like accumulation of fungi in the oral cavity. The infection is located between the extensive surface of the prosthetic plate and the mucous membrane, were a specific environmental niche is produced, creating favourable conditions for the growth of these microorganisms. We confirmed the usefulness of mycolological testing of material collected from the mouth region for diagnosis of upper GI pathologies. Based on the results obtained, mycological testing should be a standard procedure with acrylic prosthetic plate users, and where permanent prosthetic implants are planned for.

Therefore, our study on 10 patients showed that treatment by prosthetic implants, can be an effective method of prevention and treatment not only of fungal infection in the mouth, but can also further decrease pathological episodes in the digestive tract.

Our conclusions can be summarized as follows:

1. Among denture wearers, mycological infection of the mouth is often associated with the presence of fungi lining the esophagus;
2. An effective method of prevention and treatment of pathological states caused by mycological infection of the mouth and upper GI tract may be the elimination of acrylic prosthetic plates in favour of implant-supported dental prosthesis.

Conflicts of interest statement: None declared.

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