its dissolution. A strong band of PO_4^{3-} group was seen at 1039, 959 (stretching vibration) and bands at 590–610 cm^{-1} regions are due to deformation vibration of PO_4^{3-} ions. Bands pertain to the B-type CO_3^{2-} functional group at ~ 1450 and 870 cm^{-1}, indicating the substitution of CO_3^{2-} ions into the apatite. The CO_3^{2-} peak at 1550 cm^{-1} assigned to the A-type was not detected owing to none existence of OH^-. The amount of CO_3^{2-} estimated by a FTIR method using an equation given in the Materials and Methods was found to be 3.11 wt.%, which corresponds well with the results determined by CHNS/O analyzer-3.25 wt.%. Carbonates in apatite correlates positively with its solubility [7].

XRD analysis served for material crystallinity estimation. The diffraction pattern of BAP (FIG.2a) represents typical broadened peaks of semi-crystalline material. The area-weighted mean crystallite size <Lc> was calculated according to the theory of Warren and Averbach [4] from distribution <Lc>=27 nm. The crystallite size distribution curve has two major maximums (FIG.2b) and calculated log-normal distribution (solid line) roughly traces the character of the BAP distribution. Majority of the crystallites is in range 12 to 18 nm. Larger domains are represented with sizes around 30 nm. The crystallites are rather small and uniform, which is advantageous for further applications. For comparison, the average crystallite size Lc of human bone, studied by Handschin et al. [8], has been determined as 28 nm within age group 0-25, to reach a constant average domain size of 34 nm within age group 30-80. Crystallite size is connected with apatite solubility and resorbability in bone [7].

Conclusions

The chicken femur bone was used to isolate nano-bioapatite powder via chemical treatment followed by calcination. XRD, BET, crystalite size distribution and TEM proved the nanostructured character of the sample. Values of specific gravity and Ca/P molar ratio together with chemical analysis and FTIR spectrometry have demonstrated that BAP sample was Ca-deficient with Na, Mg and carbonate substitutions. Properties mentioned above are related to good solubility and resorbability, which are very important for bone remodeling. The present study shows that chicken femur bone can be effectively utilized for the preparation of nano-bioapatite powders as potential filler to biocomposites.

Acknowledgements

This study was supported by the Czech Science Foundation (No. 106/09/1000), and by Ministry of Education project Transdisciplinary Research in Biomedical Engineering II. (No. MSM 6840770012).

References

[1] Weiner S., Wagner H.D.: Annu. Rev. Mater. Sci. 1998; 28: 271-98.
[2] Skinner H.C.W.: Mineralogical Magazine 2005; 69: 621-41.
[3] Murugan R., Ramakrishna S., Panduranga Rao K.: Mater. Lett. 2006; 60: 2844-47.
[4] Warren B.E., Averbach B.L.: J. Appl. Phys. 1953; 21: 595-599.
[5] Bertoni E., Bigi A., Cojazzi G., Gandolfi M., Panzavolta S., Roveri N.: J. Inor. Biochem. 1998; 72: 29-35.
[6] Pasteris J.D., Wopenka B., Valsami-Jones E.: Elements 2008; 4: 97-104.
[7] Wopenka B., Pasteris J.D.: Mat. Sci. Eng. C-Bio S 2005; 25: 131-143.
[8] Handschin R.G., Stern W.B.: Bone 1995; 16: 355S-363S.

RESULTS FOR MODERN BANDAGING MATERIALS APPLICATION IN ALVEOLITIS TREATMENT

Shevela T.L., Pohodenko-Chudakova I.O., Groshev E.Y.

Belarusian State Medical University,
Belarusian Collaborating Center EACMFS,
220025, Minsk,
Kossmonavtov str., 9 – 1 – 63, PO Box 286.
Republik of Belarus,
ip-c@yandex.ru

[Engineering of Biomaterials, 109-111, (2011), 13-14]

Introduction

A small pain appears in the postoperative wound after the tooth extraction and when the anesthesia effect is not active. Its intensity depends on the operation severity. Alveolitis is forming after the alveolar socket injury and its gum crushing as a result of the postoperative treatment disturbance when the blood clot is washed out from the alveolar socket during the mouth wash. Microorganisms of the oral cavity penetrate into it and provoke its inflammation [1, 2].

Food ingress into the alveolar socket, not keeping of the oral cavity hygiene also provoke the alveolitis development. This complication is due to the following factors: periodont tissues injuries of the extracted tooth when the microcirculation is violated into it; infected tooth into the alveolar socket, dental deposit; infection-inflammatory focus in the region of the apical or marginal periodontitis; reduction of the activity level of the of the antimicrobial local system of the oral cavity protection. An iodoform turunda was used by surgeon-stomatologist during long time for treatment of alveolitis during surgery hours. This preparation had good recommendations as a banding material used for many years. But the turunda manufacture is a complicated process because not all pharmaceutical products are available. Iodoform turunda contains of diethyl ether, glycerin, anesthesin powder, iodophor, 70% alcohol, which are not used for alcohol production for medical purposes. Special equipment is required for this medicine storage - vessel in dark glass with lapped head. Now Borisov Plant for Medical Preparations produces banding materials such as «Diosept», «Kombiksin», «Protzelan» (FIG. 1). Above-stated confirms the topicality of this subject.

Aim of the work was to make comparative research and evaluation of the banding materials «Diosept», «Kombiksin», «Protzelan» effectiveness. In order to realize this aim we emphasized next subjects:

1) to appreciate application effectiveness of the banding material of «Kombiksin» in maxillofacial surgeon practice;
2) to appreciate application effectiveness of the banding material of «Diosept» in maxillofacial surgeon practice;
3) to appreciate application effectiveness of the banding material of «Protzelan» in maxillofacial surgeon practice;
4) to make comparative assessment of the banding materials application during the treatment of alveolitis.

Objects and methods

We made clinical examination of 32 patients with alveolitis during September, 2010 - April, 2011 in the Minsk Central Region Polyclinic Nr 14. All patients were divided into groups

FIG. 1. Bandaging matrials: a - «Diosept», b - «Kombiksin», c - «Protzelan».

according to the tretment methods: «Kombiksin» banding material was used for treatment of 10 patients, 11 patients were treated with «Diosept» and 11 patients were treated with «Protzelan» (FIG. 2).

We also studied the presence of the pain syndrome subjectively. We checked without bias during the examination the presence of the mucous tunic edema of the alveolaris appendix, its hyperemia, presence of the necrotic deposit in the region of the alveolar socket of extracted tooth. Results evaluation was performed on the third day of the preparations of control application.

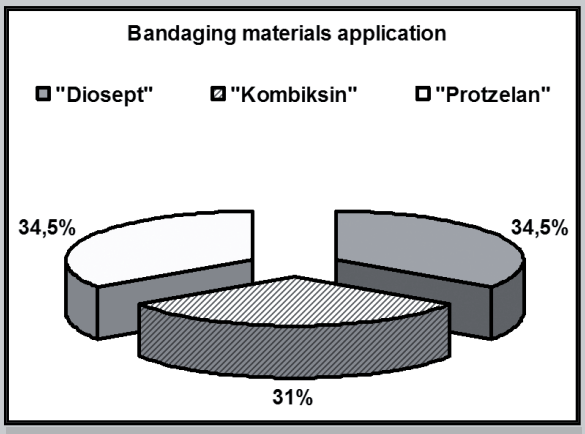

FIG. 2. Percentage of examined patients.

Results

During the treatment we discovered that during application of preparations «Diosept», «Kombiksin», «Protzelan» the «Protzelan» was effective for wound infection treatment. The first day of the treatment with «Protzelan» patients had the absence of pain in the region of the socket. By the third day, reduction of clinical indices of infection was checked (reduction of edema, necrotic exudation from the socket, hyperemia of the mucous tunic of the alveolar socket). Necrotic deposit was not absolutely found in the socket by the second day of examination. Socket cicatrization passed without development of the evident pain syndrome and local inflammatory reaction of the mucus tunic.

TABLE 1. Comparative evaluation of the dynamics of subjective and objective indices dynamics when «Diosept», «Kombiksin», «Protzelan» applied by the 3 day of the tretment accordingly to each group of control.

Indices	«Kombiksin»	«Diosept»	«Protzelan»
Pain syndrome	No pain	No pain	No pain
Edema	Not fixed	Not fixed	Not fixed
Hyperemia	3 patients had it	1 paatient ahd it	Not fixed
Necrotic deposit	Not found	Not found	Not found

Conclusion

Clinical examination after the application of banding materials of «Diosept», «Kombiksin», «Protzelan» during the out-patient reception hours by surgeon-stomatologist, confirm effectiveness of those preparations application during the treatment of the alveolitis by surgeons. Complex banding materials «Diosept», «Kombiksin», «Protzelan» in outpatient maxillofacial surgery hours could be used as preparations of choice composed of the complex treatment of alveolitis.

References

[1] Robustova, T.G.: Surgical stomatology: Manuel / Under red. T.G. Robustova. – Medicine, 1990. 576 p.
[2] Soloviev M.M.: Propaedeutics of the surgical stomatology: man. / M.M. Soloviev – M. : MEDpress-inform, 2007. 264 p.