Patients groups	Type of oral fluide microcrystallization	Frequency
I-st group (pthterygoideus mabdibularis)	I type	9,1%
	II type	27,3%
	III type	63,6%
II-nd group (mylohyoideus area abscess)	I type	4,8%
	II type	23,8%
	III type	71,4%

TABLE 1. Microcristallization types of the oral fluid classified in the patients groups according to the nosology and localization of the purulent-inflammatory processes.

Patients groups	Average means of the microcristallization data of the oral fluid	Frequency
I-st group (ptherygoideus mabdibularis)	from 1 to 1,44	4,6%
	from 1,45 to 2,44	31,8%
	from 2,45 to 3	63,6%
II-nd group (mylohyoideus area abscess)	from 1 to 1,44	4,8%
	from 1,45 to 2,44	33,3%
	from 2,45 to 3	64,9%

TABLE 2. Average means of the microcristallization data of the oral fluid in groups of patients according to the nosology and localization of the purulent-inflammatory processes of the cranio-maxillofacial area.

to the nosology and localization of the purulent-inflammatory processes (see TABLE 1). Average means of the microcrystallization data of the oral fluid in groups of patients according to the nosology and localization of the purulent-inflammatory processes and received while examination made by ourselves are classified in the TABLE 2. Authentic difference from the control data 2,12±0,13 which made $p<0,01$ for the patients of the I-st group and $p<0,001$ for the patients of the II-nd group was found during examination in modification [5] of the data for both patients groups. When we used our own modification, difference with data of control made $p<0,001$ for patients of the I-st and II-nd groups. Authentic difference was not found in both variants of examination when we have compared microcristallization data of the oral fluid of the examined groups of patients. But clear tendency ($t=1,83$) was evident to the lowest degree crystals organization of the oral fluid for the patients of the II-nd group. Comparative appreciation of the microcrystallization data of the I-st and II-nd groups patients during different modifications of the examination showed the tendency to the authentic difference of the received data according to the results of the I-st group and significant difference $p<0,05$ according to the received data of the II-nd group.

Conclusion

According to the mentioned above information we see more of authenticity and objectivity of our modification for microcrystallization examination of the oral fluid for patients with purulent inflammatory processes in cranio-maxillofacial area. It is to be used widely in practice medicine and research work.

References

[1] Bondarik E.A., Gorodetskaya O.S., Belyassova L.V. Biochemical and biophysical indexes of the oral fluid for patients with high level of caries, *Bel. med. j.*, 10, (2004), 36-38.
[2] Borovskiy E.V., Leotiev V.K. Oral cavity.- N.Novgorod: NGMA, 2001.- 304 p.
[3] Dubrovina L.A. Microcristallization of the mixed saliva for children with different intencity of the caries, *Stomatological help: Ann. Ad.* /Under red. of Kadnikov G.I. et all.- Riga: RMI, (1988), 104-108
[4] Heymans. O, Lemaire V., Nelissen X. et al. Deep vein thrombosis in a burn patient,*Rev. Med.* ,Liege, 57, 9, (2002),587-590.
[5] Leus P.A. Clinico-experimental examination of pathogenesis and pathogenetic therapy and prophylaxis of caries: Abstr. … dr. med. scien: 14.00.21 /Mosc. stomat inst. named N.A.Semashko.- M., 1977.- 30 p.

DEVELOPMENT OF NEW DESIGN OF THE ACETABULAR COMPONENT FOR TOTAL HIP REPLACEMENT

JAN SYKORA*, SVATAVA KONVICKOVA*, MATEJ DANIEL*

*LABORATORY OF HUMAN BIOMECHANICS, DEPARTMENT OF MECHANICS, CTU IN PRAGUE, CZECH REPUBLIC
**LABORATORY OF HUMAN BIOMECHANICS, CTU IN PRAGUE, FACULTY OF MECHANICAL ENGINEERING, DEPARTMENT OF MECHANICS, TECHNICKA 4, 166 07, PRAGUE 6, CZECH REPUBLIC
J.SYKORA@SH.CVUT.CZ

[Engineering of Biomaterials, 47-53,(2005),19-20]

Introduction

As yet used total replacements of a hip joint take some negative events that influence endurance of total replacement. The aim our effort is evolution of a new design of an acetabular component of a total replacement of a hip joint that those negative events will minimize or eliminate in a better case. New shape of cup is symmetrical towards the hip joint stress. This cup was designed based on a mathematical models of a distribution of contact stress. We used finite element method for a verification of a new design of a hip cup. We compute with the finite element method distribution of the contact stress on the acetabular surface. We evaluate computed models based on results of the contact stress distribution on the acetabular surface and we have effort to achieve the most homogenous contact stress distribution and reduction of maximal value contact stress.

Materials and methods

We used mathematical models of a contact stress distribution [1,2,3,4] for a determination of a contact stress distribution with an indirect measuring. Three basic mathematical models of the contact stress distribution was derived. It was a mathematical model with uniform a contact stress distribution, a model with linear descent of a contact pressure in a plane perpendicular to a resultant hip joint force and a model with a cosinus distribution of a contact stress [5]. From these three basic models, the model with the cosinus contact stress distribution on the acetabular surface (FIG.1) was chose as suitable.

We compared the results of the contact stress distribution

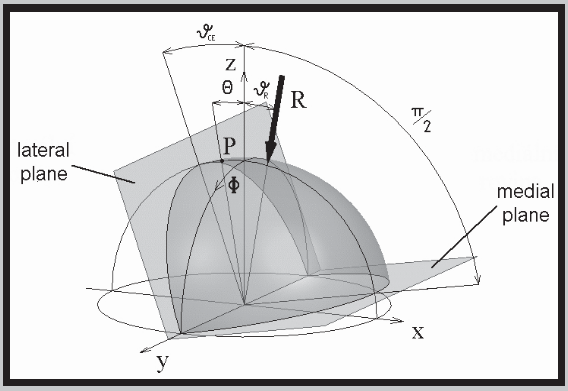

FIG.1. Mathematical model with cosinus distribution.

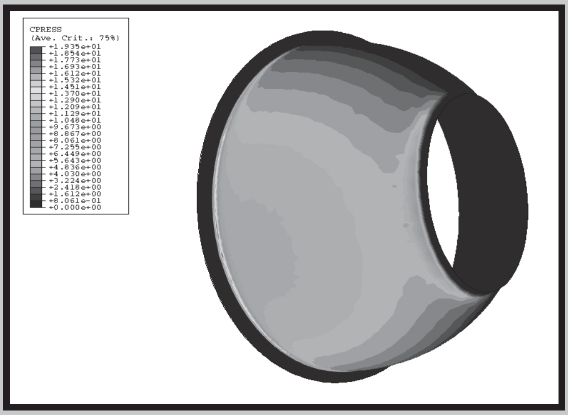

FIG.2. FEM model of the cup with hollow.

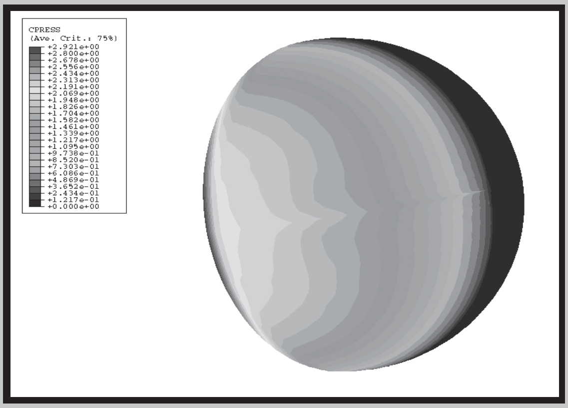

FIG.3. FEM model of the classic cup.

acquired from this mathematical model with the results of the numerical model from the finite element analysis of the contact stress distribution (FIG.3). From the comparison, we found out that both of them are very similar. We indicate on the basis of the comparison results, that it is possible to use the finite element method for the modeling of the non-weigh bearing part of the total replacement of the hip joint

The point of this technical solution of the new hip cup is to design such a shape of the joint surface that will be symmetrical towards the hip joint stress [6]. This shape is designed as the basic mathematical models of the distribution of the contact stress. Three basic forms of this shape was designed: a cup with a hollow, a tapered cup and a cup with a medial asymmetrical joint surface. The cup with the hollow was chose as the most suitable.

The finite element model of the cup with the hollow was created based on known dimension. The hollow was situated near the non-weigh bearing area of the hip joint and consistent with the mentioned condition that it was situated symmetrical towards the hip joint stress. A dimension of the hollow was optimized with calculations of few models.

Results

Finite element model of the cup with the hollow was computed as a contact job between an acetabular component of a hip joint and a femoral head. A resultant contact stress distribution is shown in FIG.2.

The contact stress distribution of the cup with the hollow is more uniform then the contact stress distribution of the basic hip cup. It is evidently from the comparison of the results of the contact stress distribution in the FIG.2 and the FIG.3.

Discussion and conclusion

We compared the mathematical model with cosinus contact stress distribution on the acetabular surface with the numerical model from the finite element analysis and indicated that it is possible to use the finite element method for the modeling the non-weigh bearing part of the total replacement of the hip joint.

We chose the most suitable design of the hip cup. It is the cup with hollow. We created the finite element model of the cup with the hollow and we computed contact stress distribution for different dimensions of the hollow. The results from these models was compared with the model of the basic cup and we determined if the contact stress distribution is more uniform.

We achieved more uniform contact stress distribution form design of the non-weigh bearing area of the hip joint.

A maximal value of the contact stress at the model cup with the hollow is greater. That was evoked with an extreme of the contact stress in a margin of this hollow. The extreme should be eliminated by a margin fillet.

Acknowledgement

The research is supported by the Ministry of Education project: Transdisciplinary research in Biomedical Engineering II., No. MSM 6840770012.

References

[1] Iglič A., Kralj-Iglič V., Daniel M., Computer determination of contact stress distribution and size of weight bearing area in the human hip joint., Computer methods in biomechanics and biomedical engineering, 2002.

[2] Daniel M., Gradient of contact stress as a parameter determining biomechanical status of human hip, Bratislava, 2001.

[3] Legal H., Introduction to the biomechanics of the hip., Springer-Verlang, Berlin, 1976.

[4] Pauwels F., Biomechanics of the normal and diseases hips., Springer-Verlang, Berlin, 1976.

[5] Sýkora J., Matematické modelování kontaktních tlaků., Praha, 2004.

[6] Daniel M., Sýkora J., Goldman T., Konvičkova S., New design of the acetabular component for total hip replacement., Biomechanics of Man, Spicak, 2004.