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ALLERGY TO CHROMIUM, NICKEL, COBALT AND TITANIUM WITH TRAUMA-ORTHOPEDICS PATIENTS

SUMMARY

The problems concerning re-operations after joint implantation, as well as the occurrence of post-operation complications with trauma-orthopedics patients, who were given metal implants are constantly considered from medical and economical point of view. The most frequent reason for the re-operation is so called: aseptic loosening arthroplasty. The article presents the analysis of various clinical post-operation complications after the long-bone treatment by means of osteosynthesis with the use of metal implants and hip arthroplasty.

Key words: *allergy, metal implants*

INTRODUCING

Metal implantation into the human body it should be remembered, that it is an artificial object and different reactions of the body should be taken into consideration. The awareness of dangerous resulting from the introducing of an artificial object into the organism caused working out of some legal roles, contained in ISO 10993 [1]. They define how implant should be introduce into the body, to make them suitable to be use for medical purposes. However, even strict following the instructions included in the norm mentioned above is not able to prevent the recipient of the implant from complications [2]. The reason for this situation, is great variety of reactions occurring between the implant and the tissue.

Surgical implants are produced of different materials, for example metallic materials such as cobalt, titanium alloys and stainless steels. The materials contain little amount of carbon and big amount of chromium, nickel and molibden. These compounds increase corrosion resistance of the implants. The metallic implants introduced into human body undergo degradation, mainly due to corrosion and aggressive biological contact between the surface of an implant and the organism in long-term use. This phenomenon is accompanied by the release of metallic ions from implant surface, which gather in the tissues surrounding the implant as well as the soft tissue (eg. liver).

The most allergic compound of all mentioned above is nickel. Entering the body, it may result in various disadvantageous reactions retarding the healing process and extreme cases leading to rejection of the implant [3].

Mitura and some others [4] scientists proved that carbon itself is not allergic. He did allergic tests (so called patch tests). Steel samples (not covered with carbon) were placed on the skin of a patient. There appeared some irritations, which pointed to allergic properties of chromium and nickel. No reactions of the organism was observed after applying the diamond powder.

As in case of metallic implants allergen compounds: nickel, chromium and molibden are used to produced jewellery. It appears that even gold jewellery contains nickel [5]. Only „sick” people react to metallic implants, while allergen jewellery is common. Particularly dangerous is piercing [6,7]. In that case allergic reactions start almost immediately (fig.1) [8].

Fig.1 The allergy to metallic compounds [8]

To avoid a complication connected with the methalosis, jewellery is covered with carbon layer, which constitute a barrier for the ions of harmful compounds [9].

RESULTS OF THE RESEARCH AND A DISCUSSION

The research included two groups of patients [10]:

I - group consisted of 97 patients with fractures arm, forearm and hip

II - group was composed of 65 patients suffering from osteoarthritis, femoral neck fracture or pseudoarthrosis of the neck of the femur after hip arthroplasty.

The patients in both groups were subjected to different tests such as patch tests with selected contact allergen (nickel, chromium, cobalt). In some cases samples of skin were surrounding implants given histopathologic examination (fig.2). In some skin imperfections were observed, they were bacteriologically examined [10].

Fig.2 A patch from the implant area of a patient allergic to metal compounds [10]

Allergic irritations appeared in the implant area (fig.3) or produced itching.

Fig.3 Allergic irritations occurring in the implant area [10]

One of the things responsible for complications is oversensitiveness to metals the implants are made of, which are used to fractures fixation.

Out of 12 patients with bone healing disorders, 6 patients were oversensitive to metals. They had confirmed patch tests and/or reaction in joint area. They concerned percutaneous osteosynthesis of fracture by ZESPOL method (fig.4) [10].

Rys.4 The fraction joint by Zespol method (upper). The allergic reaction for metallic implant used for setting the fracture (lower) [10]

Recently literature provided some convincing proofs concerning the allergic reactions to titanium implants, but it should be taken into consideration that titanic implants are not made of pure titanium, but they are alloys of many metallic compounds.

A 68 year old man, who had ear rings done 10 years earlier can serve as an example. Some allergic changes appeared. The keloid was suspected. Microscope examination showed: infiltration of macrophages, lymphocytes and plasma cells. Some spacks of: titanium, aluminium, vanadium were observed by scanning electron microscope. The conclusion is that, in some cases the titanium alloys may induce granulomatous dermatitis [11].

Another example is 6 titanium implants introduced into the jaws of a 49 year woman. All the implants were of IV degree titanium: LIBB implant, cylinder implant and the Brånemark type. It was a part of research project supervised by Ethical Commission. A serious clinical and radiological reaction followed around all the implants, which made the removal of the implant necessary. After which the allergic ailment was healed. Histological: irritation reaction and setting of the cells of intrusive object and the process of fibrination [12].

CONCLUSIONS

1. In post-osteosynthesis complications in over a half cases nickel, chromium and cobalt was responsible for the contact allergy.
2. The trauma-orthopedics wards should perform simple allergic diagnosis with patients supposed to suffer from allergy.
3. In surgery with the use of metallic implant introduced „by force”, while it is impossible to conduct the patch tests premeditation is compulsory. If it appears there were occurrences of allergy to metal implants, alternative or another treatment should be applied.

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