

# ANGIONEUROTIC EDEMA CAUSED BY DENTAL MATERIALS: A CASE REPORT

S. Dermendjiev<sup>1</sup> and Z. Stoyneva<sup>2</sup>

<sup>1</sup>Occupational Diseases and Toxicology Department, Medical University of Plovdiv, Bulgaria

<sup>2</sup>Clinic of Occupational Diseases, University Hospital Sv. Ivan Rilsky, Sofia, Bulgaria

**Summary.** The synthetic polymers are high-weight molecular organic substances which are formed from one compound (monomer) or by several compounds through chemical processes of polymerisation or polycondensation. Acrylamide, for example, is used in dentistry to harden compositions with high adhesion. Methyl methacrylate (MMK) is the main monomer in obtaining acrylic. It is widely used in households and in different industries – production of organic glasses, lacquers, resins, displays. MMK is often used as a substance in the preparation of various composites, used in dentistry, dental fillings, etc. MMK can be a health risk factor, both in terms of acute, often occupational exposure and prolonged effects on the human body. While acute exposure to high concentrations MMK produces clinical manifestations of intoxication, which clinical picture and course are well known, the adverse health effects arising from prolonged contact with this substance are very diverse, involve different organs and systems, and some are still poorly studied. It is known for example that MMK, like other polymeric substances and plastics exhibits sensitizing effect in contact with skin and mucous membranes. After exposure to methyl methacrylate, cases of contact dermatitis are described. Is it possible, however, MMK, and substances in which it participates, to create another type of allergic reactions? Responses to this question can provide the case we present.

**Key words:** *Quinke's edema, etiology, methyl methacrylate*

## INTRODUCTION

Synthetic polymers are high-weight molecular organic substances formed by one compound (monomer) or by several monomers through chemical processes polymerisation or polycondensation. Acrylamide, for example, is used in dentistry to harden compositions with high adhesion. Methyl methacrylate (MMK) is the main monomer in obtaining acrylic. It is widely used in

households and in different industries – production of organic glasses, lacquers, resins, displays. MMK is often used as a substance in the preparation of various composites, used in dentistry, dental fillings, etc. MMK can be a health risk factor, both in terms of acute, often occupational exposure and chronic effects on the human body [1-5]. While acute exposure to high concentrations of MMK produces clinical manifestations of intoxication with well known manifestations and course, the adverse health effects arising from prolonged contact with this substance are very diverse, involve different organs and systems, and some are still poorly studied [6-8]. It is known, for example, that MMK, like other polymeric substances and plastics, exhibits sensitizing effect in contact with skin and mucous membranes. After exposure to methyl methacrylate, cases of contact dermatitis are described [9]. Is it possible, however, MMK, and substances in which it participates, to create another type of allergic reactions? Responses to this question can provide the case we present.

### **AIM**

To study the possible adverse allergic effects, caused by contact with composite materials (methyl methacrylate, evicrol, etc.), used for dental fillings and other dental procedures.

### **MATERIAL AND METHODS**

We present a case report of a 52-years-old man, admitted to the Department of occupational diseases and toxicology of University hospital “Sv. Georgi” (Plovdiv, Bulgaria) from 25.01.2010 till 29.01.2010. The diagnosis at discharge was agreed as angioneurotic edema.

### **GENERAL AND SPECIFIC HISTORY OF THE PATIENT**

The man was admitted for the first time to the department, in order to diagnose health problems with allergic/toxic-allergic etiology. According to anamnesis and documentary data from 2002, the patient was with recurrent edema and rashes of the body and face, which etiology remained unclear, so far. The first acute allergic incident manifested during his hospitalization in the Cardiology Clinic of Plovdiv University Hospital, where he got urticarial itchy rash during a course with fibrinolysis. During 2004 – 2006 he was hospitalized 4 times in the Clinic of Dermatology and Venereology (Alexandrovska University Hospital, Sofia) because of urticaria and Quinke’s edema. Different trigger factors were suspected then, such as food, nuts, sweets, drugs, etc. After repeated treatment courses with systemic corticosteroids and H1-blockers, the symptoms gradually resolved. He received therapeutic courses for long periods of time, including antihistamines (Lorano, Fenistil, Clemastin, Allergosan) and H2-blockers. Since 2 days he took again H1-blocker (Cetirizin) in a

dose of 1 pill (10 mg) because of a new relapse of angioedema with predilection to the left facial half and around the oral angle. History and medical records showed variable localization of the edema, including genitals, extremities, but mainly affecting the face, sometimes migratory, often involving the eyelids, and accidentally half of the tongue. Occasional voice changes were also reported. Commonly, the angioedema was accompanied by itchy urticarial rash. The patient presented a set of photos of himself with massive facial angioedema.

**Dental status, assessed by the patient's dentist:** Reports established the presence of a gold crown, amalgam fillings, containing silver, copper, zinc and mercury in a certain ratio, as well as 2 white composite fillings, most likely from evicrol, containing methyl methacrylate. In the medical documentation, skin allergic tests with different drugs were carried out, with borderline values for Concor, Aspirin, Tenox, Crestor, Piracetam.

**Family history:** since 2001 his daughter had experienced several episodes of urticarial rash. His uncle was known as "allergic", too.

**Treatment:** At the time for an associated heart disease, the patient was treated with a daily combination of the following medicines: Trombex (clopidogrel) – a pill (75 mg) in the morning; Aspirin protect – a pill (100 mg) in the evening; Betaloc ZOK – a pill (100 mg) in the evening; Tenox (amlodipine) – 2 x 1 pill (5 mg); Torvacard (atorvastatin) – 1 pill (20 mg) in the evening.

It is well known that most of the above drugs have got side effects similar to the patient's symptoms, especially some of them as Aspirin, Clopidogrel, Torvacard, Beta-blockers.

Patient's total occupational service was 41 years, as a military person. At the time of hospitalization the patient was retired. He presented a copy of expert decision by the territory expert medical committee, certifying the following diseases:

Coronary artery disease. Incurred acute myocardial infarction of the lower, rear, lateral, basal part of the right chamber of the heart in chronified stage; Trifurcating coronary artery disease. Condition after stent placement and PTCA\* of LAD\*\* because of a high class angina. Congestive Heart failure NYHA-FC\*\*\* II. Arterial hypertension stage 3, cerebral-cardiac form. Dyslipidemia. Polyallergy. Diabetes mellitus type 2, mild without complications. Cerebrovascular disease. Condition after ischemic stroke of vertebrobasilar system without neurological deficit.

**Clinical examination established:** a satisfactory general condition; clear consciousness, adequate, afebrile; mental status, speech, mood, motor and sensory system – normal; pink skin with brownish pigmented patches on the back; well expressed hairs of the beard and chest; moderate swelling of the left facial half in the area of the oral angle (see Fig.1a, b); exanthema was not found; peripheral lymph nodes were not enlarged.

---

\* PTCA – percutaneous transluminal coronary angioplasty

\*\* LAD – Left Anterior Descending coronary artery

\*\*\* NYHA-FC – New York Heart Association functional class



Fig. 1a, b. Quinke's edema

**Respiratory system:** symmetrical breast halves; hypersonic percussion tone; bilaterally weakened vesicular breathing over the lung bases, bronchial spasm and wheezing.

**Cardiac system:** rhythmic heart rate; pulse 72 b/min; deaf heart tones; blood pressure 140/95 mm Hg.

**Abdomen** – soft and painless on palpation. Liver – at the rib arc. Spleen is not discovered on palpation. Succusio renalis negative bilaterally.

**Bone and muscle system** – properly developed.

**Laboratory tests** were carried out in accordance with the diagnostic algorithm in clinical pathway 291 of the National health insurance fund:

1. **Hematological tests:** ESR – 4 mm, HB – 155 g/l, Er – 5.02 T/l, Leu – 8.33 G/l, Hct – 0.459, MCV – 91.4, PLT – 296 G/l, Differential leukocyte count: Sg – 74.7%, Mo – 5.4%, Ly – 17.5%, Eo – 1.9%, Ba – 0.5%.

2. **Biochemical tests:** Chol – 3.7 mmol/l, Trigly – 0.80 mmol/l, Gluc – 7.0 mmol/l, T Prot 77 g/l, Creat – 89 mkmol/l, Urea – 4.1 mmol/l, T Bilirub – 13.4 mkmol/l, ASAT – 30, ALAT – 29, CK – 163, LDH – 399 U/l.

3. **Immunoassays:**

- Level of general IgE – 101.23 IU/ml (ref. up to 100)
- IgG – 39.875 (increased, ref. up to 18.37 g/l)
- IgA – 0.381
- IgM – 1.029
- C3 – 1.034 g/l (normal)
- C4 – 0.536 g / l. (increased)
- C1 – esterase inhibitor – 230 mg/l (normal)

4. **ECG** – sinus rhythm, data for incurred lower MI, ST – T criteria for left ventricular hypertrophy.

5. **Gas analyses of mixed venous blood:** pH – 7.420, PaO<sub>2</sub> – 72.8 mmHg, PaSO<sub>2</sub> – 39.9 mmHg, BE + 1.4 HbO<sub>2</sub> – 95.6%.

**Treatment regimen:** injectable steroid (Methylprednisolone) 40 mg. i.m., Chloropyramine hydrochloride 1 ampule (2 ml) i.m. daily, H<sub>1</sub>-blocker (Desloratadin), 2 x 1 pill (5 mg), H<sub>2</sub> – blocker (Famotidine) – 2 x 1 pill (40 mg)

**Outcome of hospitalization:** The patient was discharged in a good general condition, asymptomatic.

## CASE DISCUSSION

We present a typical case of angioneurotic edema, which has a prolonged course with frequent relapses. Having in mind the very broad differential diagnosis of angioedema, in this particular case, mainly two types of factors should be excluded:

1. The role of used medications to treat concomitant cardiac problems, for which angioedema has been described as relatively common side effect. The fact that the swelling often recur after withdrawal of the aforementioned drugs, practically excludes their leading role as an etiological factor in the presented case.

2. Hereditary angioedema (HAE) is another possible diagnosis, to be excluded. It is known that the “gold standard” in the diagnosis of HAE includes a combination of familial predisposition, typical clinical picture with solid type of swellings which are more often painful than itchy and laboratory diagnostic tests, of which the greatest diagnostic value is determination of C<sub>4</sub>. In this case, the level of C<sub>4</sub> is increased, while C<sub>1</sub>-esterase inhibitor is normal.

3. Possible functional C<sub>1</sub>-esterase inhibitor deficiency cannot be ruled out, it is plausible. In our case, qualitative study of this factor has not been investigated due to lack of such possibility of the immunological laboratory.

4. The probability of angioneurotic edema due to a combination of factors with different mechanisms is very high. The history of intolerance to certain foods, drugs, some of which are known to operate in nonimmune mechanisms, as well as the local irritative and sensitizing effects of the mentioned synthetic polymeric substances, applied in this patient during dental procedures should be considered.

## CONCLUSIONS

1. The spectrum of allergic symptoms after contact with composite substances containing evicrol, methyl methacrylate, etc. can be very diverse, as described by other authors [4, 6, 9], too.

2. Notwithstanding the broad differential diagnosis of angioneurotic edema, suspected as a factor that triggers allergic symptoms, the sensitizing effect of syn-

thetic polymers upon the buccal mucosa should be considered as well. This statement is confirmed also by many research studies, done recently [5, 6, 9].

3. Although the fact that angioneurotic edema is a systemic allergic reaction which unfolds largely as of first type (IgE-mediated hypersensitivity, fast type), there should be taken into account other nonimmune factors and mechanisms, that may cause similar symptoms.

4. The good knowledge of the factors and mechanisms of allergic reactions is a guarantee for the effective treatment to the existing problems in the presented patient.

## REFERENCES

1. Deval, R. et al. Natural rubber latex allergy. – Indian J. Dermatol. Venereol. Leprol., **74**, 2008, № 4, 304-310.
2. Antón Gironés, M. et al. Immediate allergic reactions by polyethylene glycol 4000: two cases. – Allergol. Immunopathol. (Madr), **36**, 2008, № 2, 110-112.
3. Gooptu, B. et D. A. Lomas. Conformational pathology of the serpins: themes, variations, and therapeutic strategies. – Annu. Rev. Biochem., **78**, 2009, 147-176.
4. Assal, C. et P. Y. Watson. Angioedema as a hypersensitivity reaction to polyethylene glycol oral electrolyte solution. – Gastrointest. Endosc., **64**, 2006, № 2, 294-295.
5. Taylor, J. S. et E. Erkek. Latex allergy: diagnosis and management. – Dermatol. Ther., **17**, 2004, № 4, 289-301.
6. Kind, F., K. Scherer et A. J. Bircher. Allergic contact stomatitis to cinnamon in chewing gum mistaken as facial angioedema. – Allergy, **65**, 2010, № 2, 276-277.
7. Kieffer, C., B. Cribier et D. Lipsker. Neutrophilic urticarial dermatosis: a variant of neutrophilic urticaria strongly associated with systemic disease. Report of 9 new cases and review of the literature. – Medicine (Baltimore), **88**, 2009, № 1, 23-31.
8. Incorvaia, C. et al. Allergy and the skin. – Clin. Exp. Immunol., **153**, 2008, Suppl. 1, 27-29.
9. Beaudouin, E. et al. Allergies in orthodontics. – Eur. Ann. Allergy Clin. Immunol., **35**, 2003, № 9, 344-351.



*Address for correspondence:*

Svetlan Dermendjiev, MD  
Occupational diseases and toxicology department  
Medical University of Plovdiv  
15a Vasil Aprilov blvd.  
4000 Plovdiv, Bulgaria  
e-mail: stefanov@raredis.org