Association of Metallurgical Engineers of Serbia *Scientific paper*
AME *UDC:903.05:669"08"(437.26)=20*

METALLOGRAPHY OF THE 9th CENTURY SWORD OF A GREAT MORAVIAN NOBLEMAN BURIED IN MIKULČICE (GRAVE No.580)

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ABSTRACT

The investigated sword was uncovered in the basilica of the important Great Moravian settlement in Mikulčice. The importance of this 9th century weapon is demonstrated by the tomb (No.580), which ranks amongst the most important Great Moravian graves. The interred, who belonged to the highest Great Moravian nobility, held among others artefacts the sword with a blade consisting of steel cutting edges welded on a central steel core. Quenching of the edges however cannot be proved by the examination; the quality of the sword is discussed in the paper.

Key words: Sword – Mikulčice - Great Moravia - Early Middle Age

INTRODUCTION

The investigated sword (i. č. 594-2979/57) was found in the grave No. 580, uncovered in 1957 during a systematic archaeological research carried out at the acropolis of the Early Medieval stronghold of Mikulčice, see Fig. 1. The stronghold was one of the principal centres of the Great Moravia Empire, which was the first Slavonic state formation north of Danube River, created in the course of the first third of the 9th century and abolished due to invasion of Avars into Carpathian basin at the beginning of the 10th century. As a whole 16 swords have been uncovered in Mikulčice Stronghold.

The sepulture with the grave (No. 580) was situated in the nave of the up to now largest uncovered Great Moravian church – three nave aisled basilica (*Cibulka 1966*; *Pošmourný 1964*; *1969*). The ostentatious garniture of the sword together with a big war knife rank among the most significant parts of the grave goods (*Poláček 2005*, 144, Abb. 3, 5). Belts of the sword garniture were provided with silver loop fitting, buckle and belt chape; the war knife has a half-round gilded silver fitting (pommel), a pattern-welded blade and is sheeted in a scabbard with a metallic fitting see Fig. 1. The interred lied in a coffin with iron fittings together with golden spherical button (so-called gombik), a wooden bucket, a war axe, a knife, a razor, a fire steel and a flint. The prestigious

situation of the grave as well as the ostensibility of the grave goods clearly evidence that the interred ranked among highest Great Moravian nobility. He was most likely a member of the ruling Mojmír's dynasty (*Poláček 2005*, 140, 144; *Shulze-Dörrlam 1995*, 565-583).

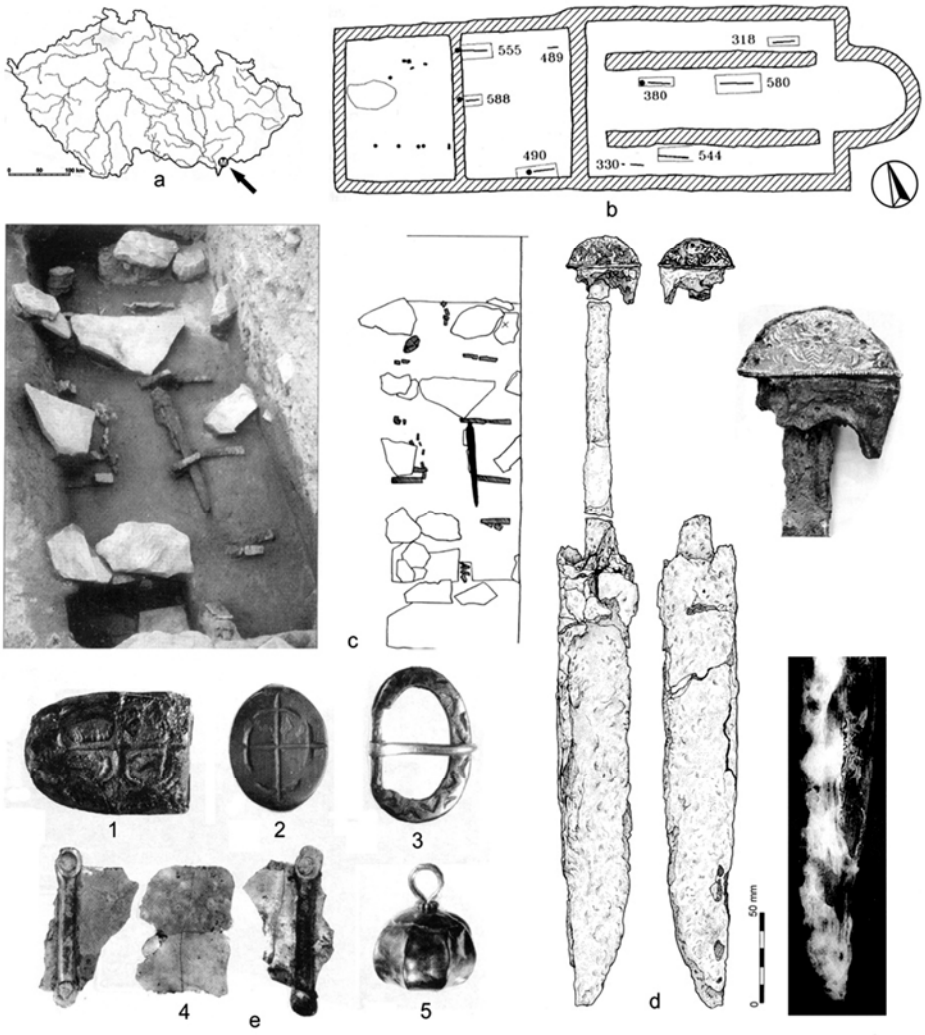

Fig. 1 - Grave 580 from Mikulčice, 9th century: a - map of the Czech Republic and situation of Mikulčice; b – basilica with the tomb 580, (Poláček 2005, Abb. 1); c – photo (Poláček 2000, 7) and drawing (Poláček 2005, Abb. 9/4) of the tomb 580 (beside the sword the fittings of a coffin are clearly visible); d – the big war knife with detail of the gilded head-tang and X-ray of the pattern-welded blade (drawing K. Urbanová); e – selected items of the grave goods (1 – belt chape, 2 – loop fitting , 3 – buckle, 4 - fitting, 5 - golden spherical button (so-called gombik), (Klanica 2002, Fig. 9).

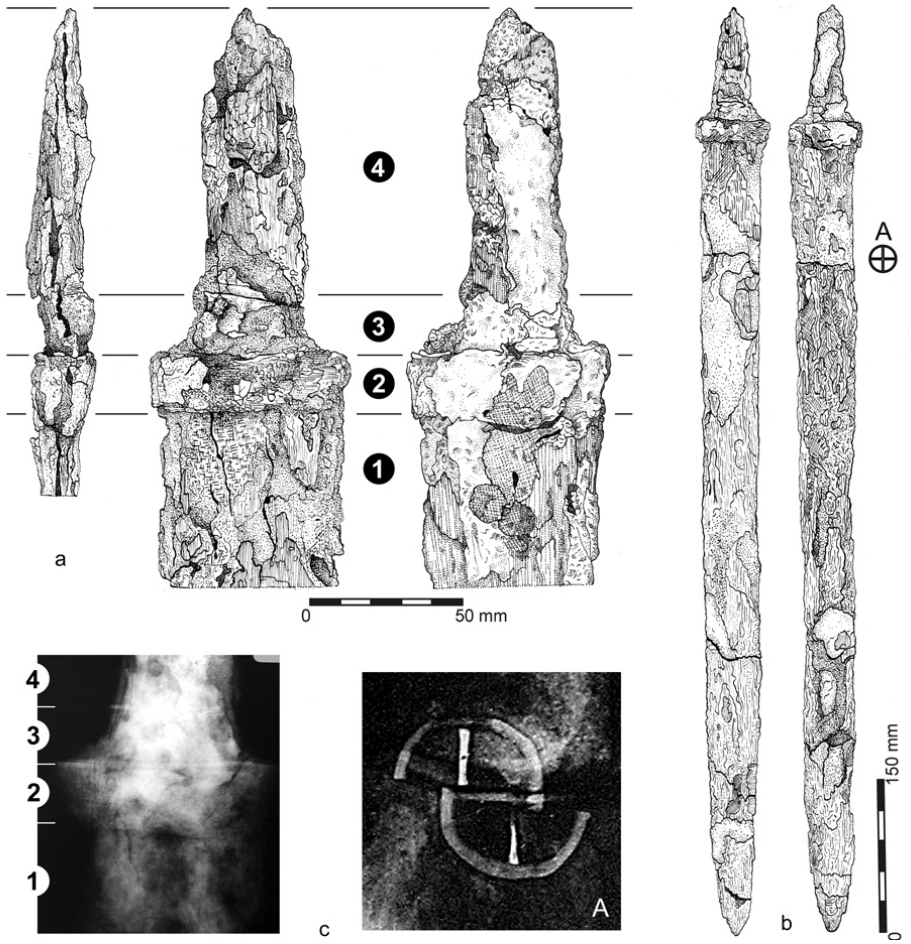

Fig. 2 - Sword from the grave 580 in Mikulčice, 9th century: a, b – drawings of the sword (1 – blade/scabbard, 2 – iron loop of the scabbard mouth, 3 – remnants of an original guard, 4 – grip); c – X-ray pictures of the sword in detail (left – the loop and guard, right – the broken inlay); (drawings K. Urbanová).

The double-edged sword, see Fig. 2, (*Košta 2005*, 172, Abb. 9) is heavily damaged. Wooden grip, originally coated with textile, was composed of two separated parts attached to a tang without any holes for rivets. Such arrangement required an attachment with the aid of pommel, which was presumably of organic material (bone, horn etc.). Preserved fragment of the guard also consisted of organic core embosomed with iron sheet. The robust blade, which can be classified as a type 2 according to Geibig (*Geibig 1991*, 85, Abb. 22) was provided with a fuller ending approximately 115 mm from the tip. The X-ray revealed a non-ferrous inlaid ornament 140 mm from the guard. The inlay placed in a crack of the blade could be interpreted as a symbol of cross in a circle, see Fig. 2. This symbol could be related to the other parts of the sword garniture (loop fitting, belt chape, fitting of the war knife), which were decorated with

crosses with triple endings of arms. Wooden scabbard was in origin coated with organic material, most likely leather sporadically preserved in the pointed part of the blade. This better preserved part also revealed a decoration consisting of grooves running crosswise the blade. The interior of the scabbard was covered with fine textile, which remnants were found underneath the wooden corpus. The mouth of the scabbard bore an iron loop. The sword is in its present state of conservation 920 mm long and weights together with remnants of the wrappings 1275 g. The blade is 807 mm and the tang 93 mm long, the guard is 20 mm tall.

With regards to the absence of the pommel, we cannot typologically classify the sword itself, neither chronologically anchor it, although some of its characteristics, for instance the form of the blade or the character of the guard, evidence dating back to the early 9th century. Such dating is confirmed also by the context of this find. While the sepulture could be dated back to the second or third quarter of the 9th century, the garniture of the sword and the war knife could have been made in the course of the first and second thirds of the 9th century. The sword as well as the whole garniture was not produced by local Great Moravian craftsmen; the question of the provenance remains, due to its exceptionality uncertain. Besides the Frankish, the Byzantine origin could be considered for example.

METHODOLOGY OF INVESTIGATION

Metallographic examination has been carried out on both sides of the blade sample (cut out 380÷400 mm far from the tang point, see Fig. 3) Metallographic specimens were prepared by standard approach, i.e. mounted in resin, wet grinded and polished by diamond paste. The examinations were performed on a microscope Olympus BX60, photos of structures were taken by digital camera Olympus Camedia C-5050. Both unetched (macro- and micro-observation – arrangement, forms and quantity of slag inclusions; after practice of the laboratory evaluated by Jernkontoret standard) as well as etched state (nital – micro-observation (carbon); Oberhoffer – macro-observation (phosphorus)) of the specimens was studied and documented. Hardness was measured at the Department of Material Science of the Technical University of Liberec by BEUHLER Micromet 2100 hardness tester. Chemical composition of welds (white lines) and of one metallic piece found in the corrosion layer were performed on a PHILIPS XL 300 scanning electron microscope with attached EDAX energy dispersive spectroscopy equipment (20 kV, ZAF, 50 s).

METALLOGRAPHIC EXAMINATION

The metallographic description is basically identical for both specimens; differences are only in sizes and forms of the described areas, see Fig. 3. Fine slag inclusions appear in matrix of the specimens; their numbers are relatively high – 3rd or even 4th degree according to Jernkontoret. When etched in nital, structure areas I (cutting edges) show a structure of very fine pearlite with ferrite in grain boundaries (c. 0.7 % up to eutectoid composition); grain size reaches 7÷8 ASTM, hardness is 273 ± 21 HV0.3. The core of the sword blade (areas II and III) appears beyond a “white” weld line. Areas II are pearlitic-ferritic with

carbon content in the range of 0.6 - 0.7 %, grain size is about 7 ASTM, although the structure is locally coarser (6 ASTM) as well as finer (8 ASTM). Hardness reaches 215 ± 14 HV0.3. Areas II are lengthwise interleaved with several light lines which represent welds containing about 1 % Ni (measured in the specimen B). Areas III are similar to areas II, thus consist of pearlitic and ferritic grains with 0.7 % up to eutectoid concentration of carbon; grain size is 7÷8 ASTM. Areas II and III are separated by islands of very fine pearlitic-ferritic structure (9÷10 ASTM). Last determinable area (IV) is a little iron piece (verified by EDAX microanalysis) found in a corrosion layer of the specimen B; the iron particle bears intense traces of cold working (hardness not measured).

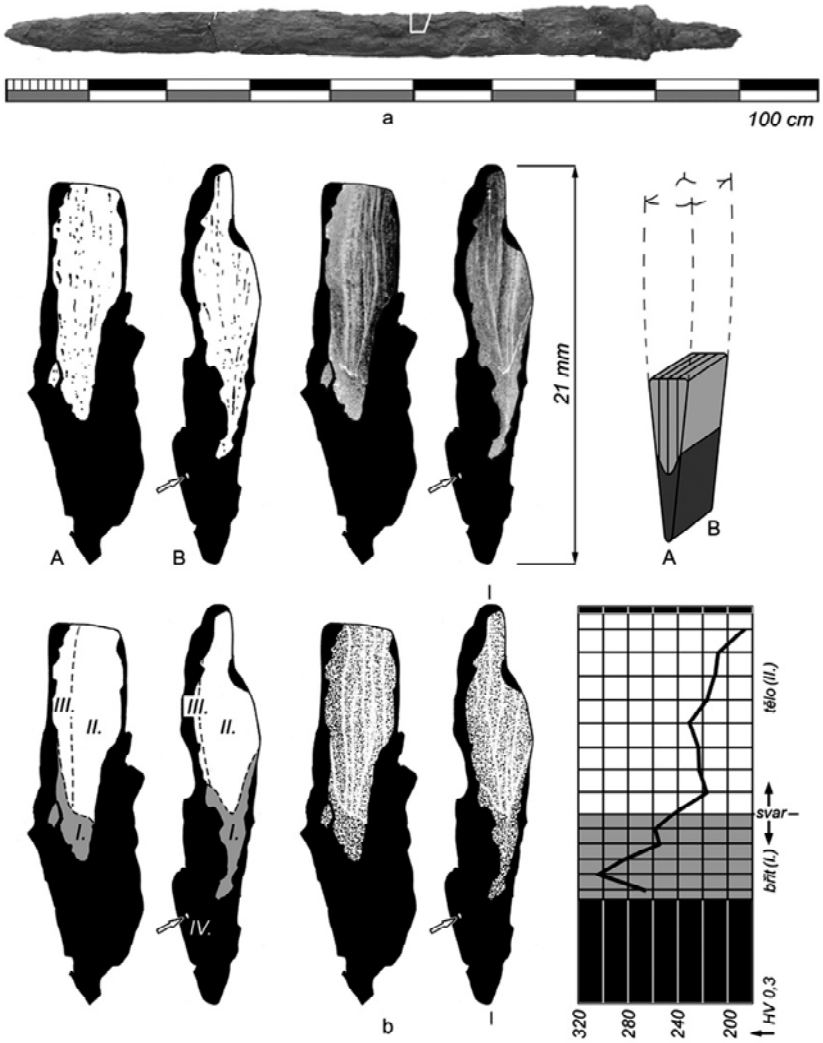

Fig. 3 - Sword 580; Mikulčice; 9th century: a – the investigated sword; b – schematic drawing of the specimens (from the left: unetched condition, etched after Oberhoffer, described areas of the structure, hardness /Vickers/, etched with nital);

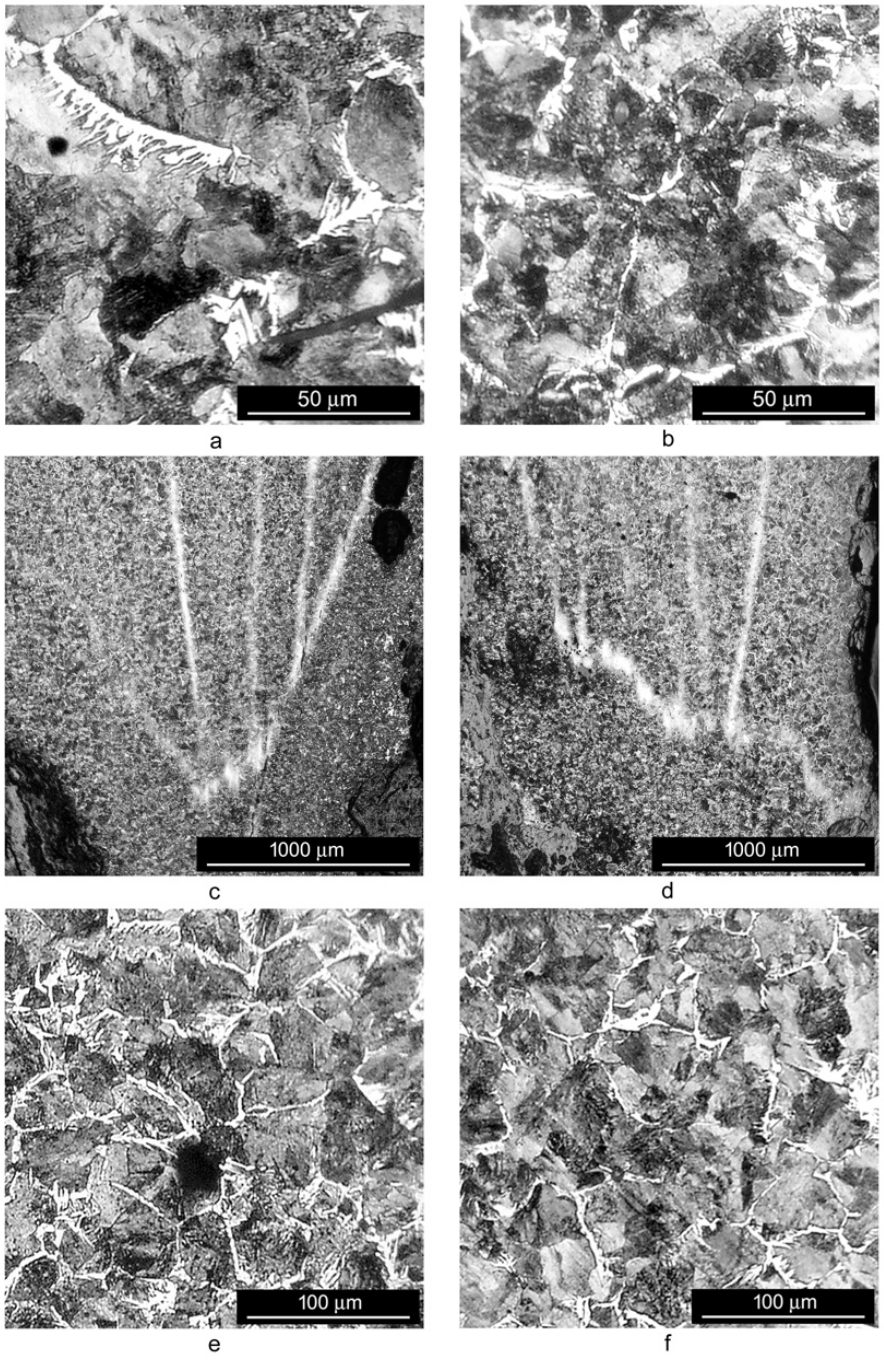

Fig. 4 - Sword 580; Mikulčice; 9th century: a, b – fine pearlite and ferrite in area I (cutting edge); c, d – light traces of welds between the cutting edge and core of the blade; e, f – pearlitic-frritic structure in area II (core); etched with nital.

EVALUATION

The blade has a steel core with welded-on steel cutting edges. The blade construction most likely consisted in butt-welding-on of edge rods onto the piled core with subsequent final forming and in the place of sampling rather rapid cooling (although not quenching yet at least in the preserved part of the cutting edge). The core bears several layers which could be formed either by mutual welding of several sheets either by multi-bending and welding of one semi-product; it could be also a combination of both approaches. The core is just a little less carbon steel then the cutting edges. The piece of iron in the corrosion does not relate to the blade itself; it is most likely a remnant of some iron part of the original scabbard. The sword is of very good or even excellent quality.

DISCUSSION

According to the sample examined, the blade does not seem to be pattern-welded neither constructionally complex and shows a rather simple construction. The cutting edges made of excellent steel were ordinarily welded onto the piled steel blade core. The nearest analogy is from this point of view the 9th century sword from princep's tomb discovered in Kolín; the examined blade specimen was very similar to our case *(Pleiner 1962 164, T. LXVII)*. Also the blade of a sword from Nemilany (grave H41) with „ULFBERHT“ inscription has the same construction *(Selucká- Richtrová-Hložek 2002; Kalábek 2002)*. Both these swords are evidently excellent products. Unfortunately we cannot recognize the quality of our blade without doubt, because we cannot prove its quenching. Steel in the cutting edge is however good and it bears traces of rapid cooling. It would suggest good treatment and enables us to assume that the quenching had been carried out at least in the first third of the blade length. It would correspond to the trend which we notice in the case of medieval swords in general. Quenched cutting edges prevail in the first third of the blade length (near the point), the quenched and unquenched edges appear more or less in the same rate in the second third and finally edges without any heat-treatment are most often metallographically noticed in the last third of the blade (near the guard). Our blade has been sampled on the boundary of the second and third third of its length, thus unquenched state could be still in accordance with the standard treatment or state of preservation. The blade of the sword from Nemilany ranks among the cases with evidently quenched pointed part of the blade and unquenched part next to the guard. There is still another aspect which cannot be omitted concerning our sword. The point of the cutting edge is heavily corroded - up to 5 mm from the point of the edge, which is the most significant part for the evaluation of the heat-treatment. The blade has in the place of sampling all steel construction and could reach excellent service characteristics. An excellent hard cutting edges and elastic blade core could be reached by bainite quenching, as well as by martensite quenching applied only to cutting edges in order to retain sufficient toughness of the blade core. Tempering of edges could succeed afterwards by heat from the non quenched parts of the core. Brittleness of cutting edges would be decreased alike a risk of cutting edge chipping. Blades of

the same or similar construction thus required relatively complicated heat-treatment. However such heat-treated steel blades were of better quality than iron cored blades, which could be easily quenched in all volume without risk of decreasing the accessible core quality. An application of the cutting-edge quenching could be illustrated by the sword from Kolín, whose blade was martensite quenched only in the range of about 7 mm from the preserved cutting edge line towards the core. This blade was nonetheless quenched also in the last third of the blade length, 140÷160 mm from the guard. Another case of the quenching which was limited onto the cutting edge line could be a sword from Kanin (grave 184), *(Hošek –Mařík 2004)*. Already 3 mm from the preserved cutting edge point the structure does not correspond with the quenched state. Therefore also in the case of our sword the possibility of the original blade quenching cannot be omitted. If the blade was actually quenched it was an excellent weapon.

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