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Minor Malformations: Neonatal or Anthropological Story?

Darinka Šumanović-Glamuzina[1], Tomica Božić[1], Vesna Brkić[1], Adisa Robović[1] and Violeta Saraga-Karačić[2]

[1] Clinic for Child Diseases, University Clinical Hospital Mostar, Mostar, Bosnia and Herzegovina
[2] Clinic for Ginecology and Obstetricion, University Clinical Hospital Mostar, Mostar, Bosnia and Herzegovina

ABSTRACT

Minor malformations (mM) are mild physical deformities that with their incidence, number and evolution may be external indicators of hidden, more serious disorders. Most often these are recognized by the neonatologists. First studies done some forty years ago showed an average incidence of 15% in the general population of newborns and about 50% in children with major malformations (MM). A study done in Maternity Hospital Mostar covering a one-year cohort of the newborns and assessing 38 mM showed an average incidence 23.7% mM in children without MM. Twelve mM have had a frequency above 1%, many of them in the head region. The most frequent specific mM was a deep sacral dimple (4.6%). Eighteen mM malformations that appeared more often were re-evaluated three months later. A large part (50–80%) disappeared, but a small number (about 17%) were newly discovered. In the newborns with MM, the incidence of mM was 57.5%. 15 of 23 children with MM (65.2%) had more than three associated mM. The highest percentage was in the group of hypotrophic newborns. The connection of mM with MM and specificity of incidence of mM in one population are the reason why the search for mM in the neonatal period could be benefit also for children and whole population.

Key words: *minor malformations, newborns, neonatology, anthropology*

Introduction

A simple physical examination of the newborns at birth and a search for visible developmental deformities (malformations) remains an important part of neonatal practice. Observation of gross (major) malformations (MM) is important because of potential emergency procedures. The search for unapparent (minor) malformations (mM) requires patience, skill and knowledge about their true meaning. Minor malformations are considered to be structural variants that do not have medical or cosmetic affect on carrier[1]. Nevertheless, they are important because of possible significant association with serious visible or hidden errors of development. Thus, they can serve as an external indicator of pathological morphogenesis[2–4].

In the 70ties and 80ties of past century, when the first studies of the mM incidence and meaning were carried out[5–14], the average incidence was estimated to be about 15% of all newborns, but subsequent analyses indicated a higher incidence (30–40%)[15,16]. Thereafter the interest in that type of research waned. It is still not clear, however, what is the predictive value of mM, and what a true mM is in one ethnic group and a developmental variant in another[17].

Search for the incidence of mM was often performed in selected populations of particular clinical entities and with regard to selected mM. The control groups were variable. The data are therefore difficult to compare. The occurrence of mM need not be an expression of aberrant morphogenesis but may constitute an ethnic feature. If a particular mM exceeds specific incidence of 4% it is probably a developmental variation of a specific ethnic group[4].

The incidence of mM in the Mostar region has been reported in a preceding paper[18]. Extending that work, we describe the frequency of distinct mM, their correlation with MM, and the ontogenetic evolution of most important mM.

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Patients and Methods

Mehes[3] recommends mM to be assessed in so-called »healthy« newborns i.e. those without discernible MM, and in the newborns »with associated MM«. Our study was done observing that principle at the Maternity and Neonatology Departments of the University Clinical Hospital Mostar from 1995 to1996. Mostar is a town in the southern part of Bosnia and Herzegovina and is a centre of two cantons with about 250 000 inhabitants. Almost all deliveries (about 1600 *per* year) take place in our hospital, except for some 500 deliveries *per* year in adjacent small towns. We investigated a one-year cohort of the newborns (1995–1996) and invited affected extramural children to our Hospital for a follow up during infancy. All live births 27 or more weeks of gestational age (as calculated from the mother's last period) were examined during the first 48 hours of life by two experienced neonatologists (DSG and VSK).

Minor malformations were assessed and recorded according to the modified Mehes's list comprising 38 items. Recommendations of two other authors were also taken into account[2,3]. Major malformations were registered according to the recommendations of EUROCAT[19]. Infants having MM were further examined in more detail and followed through the infancy in order to find possible developmental errors. Informed consent was obtained from the mothers (or caregivers) of those children. The method was prospective cohort analyses. The data are presented as simple distribution. χ^2-test was used for testing the significance.

Results

During the period of investigation (1995/6) 1,853 children were born (1,836 live born, 17 stillborns). There were 1,796 healthy newborns and 40 with one or more of MM. Minor malformations were detected in 425 of the 1,796 healthy children (23.7%) and in 23 of 40 those with major malformations (57.5%; Table 1). The difference is statistically significant ($\chi^2=14.1$, df=1, $p<0.05$)

The incidence of individual mM and their gender distribution is presented in Table 2.

Twelve mM occurred with an incidence above 1%: deep sacral dimple, moderate rectal diastasis, hypertelorism, low set ears, small mandible, prominent occiput, mongoloid slant of the palpebral fissures, primitive shape of the ears, prominent heel, high-arched palate, simian crease, wide distance between the 1st and 2nd toes. No significant differences were noted with regard to the gender, except for a small mandible. That mM was present more often in boys ($\chi^2=9.28$, df=1, $p<0.05$). We also investigated the difference between the genders with regard to the number (1, 2, 3 or more) of associated mM. There were no significant differences.

The prevalence of minor malformations changed with the growth of the child. The frequency of 18 mM (extending screening) which appeared more often in our population, was re-assessed after three months. On control examination at the age of three months 186 infants have had malformations (163 mM, 23 MM). Infants without malformation at birth (197 infants) served as the control group. The prevalence of selected mM at the age of three months is presented in Table 3. Thus, some mM disappear or become inapparent with child's growth. In the group of newborns who have had major malformation (40), 23 have also had one or more minor malformations. 15 of those 23 had three or more associated mM, and the highest percentage was in the group of hypotrophic newborns (62.5%).

Discussion

A search for the exact incidence of minor congenital malformations in the era of sophisticated medicine seems to be of anthropological rather than clinical significance. But small developmental errors noted in the neonatal period may be valuable predictors of later clinical problems[3].

Our findings confirm the view of other authors that children having major congenital malformations (MM) are more prone to minor malformations (mM) than the apparently normal children[1–3]. As shown, 57.5% of neonates with MM had one or more mM, as compared to 23.7% neonates without MM. In a larger population of newborns (4,143) Leppig et al. found about 39.9% examples of mM. Older studies (Marden[1], Mehes[3]) found the incidence of mM in the newborns of 14.1% and 16.2% respectively. Tsai et al. found that 44.9% newborns in the Chinese population at Taiwan had one or more mM[16]. A study carried out in Mainz during the period 1990–1998 found the incidence of mM to be 35.8% of all newborns and fetuses[20].

TABLE 1
PROPORTION OF INFANTS HAVING 0, 1, 2, 3 OR MORE MINOR MALFORMATIONS

No.of minor malformation per neonate	Infants without major malformations n=1.796		Infants with one or more major malformation n=40	
0	1371	76.3	17	42.5
1	238	13.3	6	15.0
2	113	6.3	2	5.0
≥3	74	4.1	15	37.5
Total affected	425	23.7	23	57.5

TABLE 2
INCIDENCE OF MINOR MALFORMATIONS BY SITE AND GENDER

	Male		Female		Total	
Head and neck	N	‰	N	‰	N	‰
Small mandible	40	22.2	17	9.5	57	31.7
Prominent forehead	2	1.1	2	1.1	4	2.2
Flat occiput	0	0.0	0	0.0	0	0.0
Prominent occiput	26	14.5	30	16.7	56	31.2
Extra posterior cervical skin	3	1.7	3	1.7	6	3.4
Eye						
Epicanthic folds	18	10.0	26	14.5	44	24.5
Mongoloid slant	5	2.8	12	6.7	17	9.5
Antimongoloid slant	2	1.1	0	0.0	2	1.1
Short palpebral fissures	2	1.1	1	0.6	3	1.7
Hypertelorism	26	14.5	39	21.7	65	36.2
Ptosis	0	0.0	0	0.0	0	0.0
Ears						
Small ears	2	1.1	3	1.7	5	2.8
Asymmetrical size	1	0.6	1	0.6	2	1.2
Primitive shape	22	12.2	16	8.9	38	21.2
Low-set aers	33	18.4	28	15.6	61	34.0
Preauricular tags	7	3.9	6	3.3	13	7.2
Preauricular fistula	4	2.2	5	2.8	9	5.0
Mouth						
Small oral opening	1	0.6	1	0.6	2	1.2
Large tongue	1	0.6	7	3.9	8	4.5
High-arched palate	13	7.2	8	4.5	21	11.7
Bifid uvula	0	0.0	0	0.0	0	0.0
Hand						
Simian crease	13	7.2	8	4.5	21	11.7
Clinodactyly	1	0.6	5	2.8	6	3.4
Single crease on 5^{th} fingers	0	0.0	0	0.0	0	0.0
Foot						
Partial syndactyly 2^{nd} and 3^{rd} toes	7	3.9	2	1.1	9	5.0
Wide distance between 1^{st} and 2^{nd} toes	13	7.2	6	3.3	19	10.5
Broad hallux	0	0.0	0	0.0	0	0.0
Hallux dorsiflexion	2	1.1	0	0.0	2	1.1
Prominent heal	17	9.5	21	11.7	38	21.2
Thorax						
Short sternum	0	0.0	0	0.0	0	0.0
Accessory nipples	1	0.6	0	0.0	1	0.6
Wide set nipples	0	0.0	1	0.6	1	0.6
Abdomen						
Umbilical hernia	1	0.6	5	2.8	6	3.4
Inguinal hernia	2	1.1	1	0.6	3	1.7
Moderrate rectal diastasis	40	22.3	40	22.3	80	44.6
Skin						
Raised and large hemangioma(s)	4	2.2	1	0.6	5	2.8
Large pigmented nevi	1	0.6	1	0.6	2	1.2
Deep sacral dimple	33	18.4	50	27.8	83	46.2

TABLE 3
PREVALENCE OF MINOR MALFORMATIONS AT THE AGE OF THREE MONTHS

Minor malformation	No. of infants at birth	No. of infants examined at 3 months of age	Presence of minor malformations	
			N	%
Small mandible	57	30	22	73.3
Prominent occiput	56	28	21	75.0
Hypertelorism	65	38	32	84.2
Epicanthic folds	44	31	26	83.9
Asymmetrical size of ears	2	2	1	50.0
Primitive shape of ears	38	23	4	17.4
Low set ears	61	36	9	25.0
Preauricular tags	13	7	7	100.0
Preauricular fistula	9	4	3	75.0
High-arched palate	21	12	1	8.3
Simian crease	21	8	7	87.5
Umbilical hernia	6	4	1	25.0
Inguinal hernija	3	3	1	33.3
Moderate distases recti	80	44	6	13.6
Raised and large haemangioma	5	4	4	100.0
Large pimneted nevi	2	1	1	100.0
Deep sacral dimple	83	54	48	88.9

Different results could be attributed to the influence of geo-ethnic factors. It may be noted that more recent studies have found increasing incidences of mM (Marden[1] 14.2%, Leppig[15] 39.9%, Tsai[16] 44.9%). Recent studies have taken into account a modified list comprising more than 60 types of minor anomalies. Studies of the incidence of various mM have actually more anthropological than neonatological, clinical significance since they offer an insight into developmental varieties in different regions and in different populations. Comparison of our results with four largest studies of mM in the newborns in other countries witness to that. We recorded more preauricular fistulas, low-set ears and perauricular tags then in four above-mentioned studies[1,3,4,15].

TABLE 4
NEONATES WITH MAJOR MALFORMATIONS: DISTRIBUTION BY BIRTH WEIGHT, GESTATIONAL AGE AND THE NUMBER OF ASSOCIATED MINOR MALFORMATIONS

Neonate status	Number (and percent)	Minor malformations per neonate			
		0	1	2	≥3
Full term, eutrophic	30 (75%)	12	5	2	11
True premature	2 (5%)	2	0	0	0
Small for gestational age	8 (20%)	3	1	0	4
Total	40	17	6	2	15

Previous investigations implicated mM in the region of ears as an indication for further search for hidden anomalies of the urinary system. Newer works assumed a more realistic approach with regard to that clinical sign[21]. We found no urinary tract anomalies in our newborns having such mM.

Our study showed no significant differences regarding the number of associated mM. The gender incidences of mM were comparable, except for a higher incidence of small mandible noted in boys. We have no explanation for that observation. The most frequent mM in our study was deep sacral dimple (4.6%). It may represent a phenotypic variant. Some authors propose that mM can be considered a variation if its frequency exceeds 6%[22]. And, if an mM appears through several generations (usually an autosomal dominant feature) it should be considered a hereditary feature rather than a marker of aberrant morphogenesis.

High incidence of epikantic fold and hypertelorsm in our population could be an anthropological feature, but there is also a possibility of its overestimation as it could have been a familial stigma. Tsai et al. considered simian crease, upward slant and frontal bossing as normal variants for Chinese newborns[16]. In other ethnic groups, however, those signs serve as highly predictive markers for some chromosomal aberrations and specific syndromes[3]

Persistence or disappearance of mM in later life has been studies in some works[3,23]. We analyzed the presence of 18 high frequency mM three months after the birth, using a group of normal children (not affected at birth)

as the control group. Some mM persisted (large hemangioma, large pigmented nevi, preauricular tegs) some disappeared (primitive shape of ears, high arced palate, umilical hernia). Our observations are compatible with the study by Mehes[3]. The percentage of mM declined from 23.7% at birth to 16.7% at the age of 3 months. A possible explanation for that finding could be an improved diagnostic reliability at 3 months as opposed to a poorer discernibility at birth. Disappearance of some mM or the emergence during time emphasize the difficulties for objective evaluation and quantification of phenotypic variants such as mM. It also prompts us to continuously follow children with mM through the early childhood and to continuously educate the neonatologists in diagnostic skills using the schemes and knowledge of experienced researchers. Assessment of minor malformations is also useful for the genetic-environmental interactions in our population.

In the group of children (with associated MM) we registered much more mM (57.5%) than in children without MM (23.7%). The frequency (2.18%) of MM was the subject of another study and was reported previously[24]. The present study revealed that in the group of MM associated with mM, 15 of 23 children (65.2%) had three or more mM. Most of those 15 children were hypotrophic newborns (62.5%). Marden[1] found that 20.0% of the newborns with MM had more than three mM, Leppig[15] found 19.1%, and Mehes[3] 13.1%. Minor malformations were associated in a broad sense, none showing a firm linkage with a specific MM. There is, however, evidence of high frequencies of some mM in some specific syndromas[1]. Smith claims that mM are a nonspecific sign of altered morphogenesis[4].

In conclusion, knowledge about the incidence of minor malformations in a population is important for the neonatologists who must determine what is normal and what is not. Recognition of true minor malformations, particularly if their number exceeds three, should prompt a proactive attitude to the children that might require medical attention for hidden anomalies.

REFERENCES

1. MARDEN PM, SMITH DW, McDONALD MJ, J Pediatr, 64 (1964) 357. — 2. HOOK EB, MARDEN PM, REISS NP, SMITH DW, Teratology, 13 (1976) 47. — 3. MEHES K, Minor malformationes in the neonate (Budapest, 1983). — 4. JONES KL, Minor Anomalies. In: Smith's Recognizable Patterns of Human malformation (WB Saunders Company, Philadelphia, 1997). — 5. ŠKRINJARIĆ I, JUKIĆ J, ŠKRINJARIĆ K, ULOVEC Z, Paediatr Croat, 46 (2002) 115. — 6. FIRESTONE P, PRABHU AN, Journal Abnormal Child Psychology, 11 (1983) 207. — 7. KIRKLAND RT, KIRKLAND JL, LIBRIK I, Pediatrics, 49 (1972) 608. — 8. CAMBELL M, GELLER B, SMALL AM, PETTI TA, FERRIS SH, Am Journal Psychiatry, 135 (1978) 533. — 9. QUIN PQ, RAPOPORT JL, Pediatrics, 53 (1974) 742. — 10. KROUSE JP, KAUFFMAN JM, Journal Abnormal Child Psychiatry, 10 (1982) 247. — 11. SMITH DW, BOSTIAN KE, J Pediatr, 65 (1964) 189. — 12. HALVERSON CF, VICTOR JB, Child Dev, 47 (1976) 281. — 13. WALKER HA, J Autism Child Schizophr, 7 (1977) 165. — 14. HOLMES LB, MOSER HW, HALLDORSSON S, MACK C, PANT SS, MATZILEVICH B, Mental retardation: An atlas of diseases with associated psysical abnormalities (Macmillan, New York, 1972). — 15. LEPPIG KA, WERLER MA, CANN CI, COOK CA, HOLMES LB, The Journal of Pediatrics, 110 (1987) 531. — 16. TSAI FJ, TSAI CH, PENG CT, WU JY, LIEN CH, WANG TR, Acta Paediatr, 88 (1999) 323. — 17. ADAM M, HUDGINS L, NeoReviews, 4 (2003) e99. — 18. ŠUMANOVIĆ-GLAMUZINA D, Paediatr Croat, 48 (2004) 204. — 19. EUROCAT WORKING GROUP, Eurocat Guide 1 for registration of Congenital Anomalies (Catholic University of Louvain, Brussels, 1990). — 20. QUIâER-LUFT A, STOLZ G, WIESEL A, SCHLAEFER K, SPRANGER J, Arch Gynecol Obstet, 266 (2002) 163. — 21. FRASER FC, LING D, CLOGG D, NOGRADY B, Am J Hum Genet, 2 (1978) 241. — 22. DESHPANDE SA, WATSON H, Arch Disease Childhood Fetal & Neonatal Edit, 91 (2006) 29. — 23. MIHIĆ DB, BOJANIĆ ZS, Kongenitalne malformacije (Medicinska knjiga, Beograd-Zagreb, 1987). — 24. CHRICHTON JU, DUNN HG, Mc BBURNEY AK, ROBERTSON AM, TREDGER E, J Pediatr, 80 (1972) 830. — 25. ŠUMANOVIĆ-GLAMUZINA D, SARAGA-KARAČIĆ V, RONČEVIĆ Ž, MILANOV A, BOŽIĆ T, BORANIĆ B, Croat Med J, 44 (2003) 579.

D. Šumanović-Glamuzina

Clinic for Child Diseases, University Clinical Hospital Mostar, Kardinala Stepinca bb, 88000 Mostar, Bosnia and Herzegovina
e-mail: dara.glamuzina@tel.net.ba

MALE MALFORMACIJE: NEONATOLOŠKA ILI ANTROPOLOŠKA PRIČA

SAŽETAK

Male malformacije (mM) su fizičke deformacije blagog intenziteta, čiji broj i nastanak može biti pokazatelj ozbiljnijih promjena u tijelu. Najčešće ih prepoznaju neonatolozi. Prva istraživanja su provedena prije oko četrdeset godina ukazali su na incidenciju od 15% u općoj populaciji i oko 50% u populaciji djece s većim malformacijama (MM). Istraživanje u Kliničkoj bolnici Mostar tijekom jedne godine koje je pokrivalo 38 mM ukazalo je incidenciju od 23,7% kod djece bez MM. 12 nM imalo je frekvenciju veću od 1%, mnogo od njih u području glave. Najčešća malformacija bila je pilonidalni sinus (4,6%). Osamnaest nM bile su pregledane tri mjeseca nakon dijagnoze. Veliki dio njih je nestao (50–80%), a oko 17% ih je bilo novo-otkriveno. Kod novorođenčadi s MM zabilježena je prevalencija od 57,5%. 15 od 23 djece s MM imalo je više od tri mM. Najveći postotak zabilježen je kod hipotrofične novorođenčadi. Povezanost mM i MM ukazuju na nužnost pregleda mM u neonatalnom razdoblju, koja donosi korist i djeci i društvu u cjelini.