

Epidemiology of Circumcision-Related Mortality in Iran: A 10-year Survey

Circumcision is a relatively safe procedure with a low rate of complication which ranges from 0.19%-3.1%.^[1] The majority of complications are minor and treatable.^[2] However, circumcision-related deaths have been reported in some patients as an extremely rare occurrence.^[3-6] In Iran, circumcision is a ritual that is mandatory for all Muslim boys. Hence, according to male birth records in the whole country, about 500,000 neonatal circumcisions were performed in Iran in 2011.^[7] However, no epidemiological study has reported prevalence of circumcision-related mortalities in the country. In the last 10 years, we have obtained data from the legal medicine archives of all 31 Iranian provinces, and documented the factors that contributed to this subject. Hence, we decided to study the factors that contribute to these deaths so as to improve preventive measures. We report cardiac arrest due to induction of general anesthesia and hypersensitive reactions to local anesthetic agents including mainly lidocaine solution 2% as the most common final causes of death. The main message from these results is to not use general anesthesia for circumcision. Several allergic reactions related to this specific type of lidocaine solution were reported in Iran. Therefore, Iranian ministry of health and medical education has forbidden the use of this drug.

In this retrospective descriptive study, registered circumcision-related mortality data, provided by the Iranian Legal Medicine Organization for a 10-year period between 2001 and 2010, were obtained. According to Iranian law, all deaths resulting from circumcision must be investigated to determine the exact cause of death. All such deaths are referred to forensic medicine centers in each province, and then all the data are sent to the main center, the capital city of each province.

The data recorded from the Legal Medicine Organization Registry consisted of parents religion, the age of the boys at circumcision, where, why, and who performed the operation, type of anesthetic drug used, existence of a co-morbidity before the surgery, past medical history, first postoperative complication, place of death, and time interval between surgery and first complication.

Other related data used in our analysis were the cause of death documented by autopsy, pathological, and toxicological reports. Final causes of death were categorized into seven groups: cardiac arrest due to induction of general anesthesia, hypersensitivity to anesthetic agents, apnea, postoperative bleeding, unknown, and other causes.

The data was analysed using the SPSS 16 statistical software for Windows. Paired *t*-tests were used to evaluate for statistical significance and *P* values less than 0.05 were considered significant.

We recruited circumcision-related mortality records from the legal medicine archives of all 31 Iranian provinces. Seventeen provinces reported no circumcision-related deaths over the study period. Two populous provinces of Isfahan and Razavi Khorasan failed to report their mortalities. Table 1 represents the distribution of circumcision-related deaths over the provinces of Iran during the study period.

Finally, we included a total of 38 boys' circumcision-related deaths from the legal medicine archives of 12 provinces of Iran. The parents of the deceased were all Muslim.

The age of the boys who died following circumcision ranged from four days to 5 years. Of all boys who died, nine (20%) were circumcised within the first month of life.

The majority of circumcisions which resulted in death were performed in doctor's offices (14 37%), followed by home (12 32%), hospitals (10 26%), and clinics (2 5%). None of the boys was circumcised for a medical reason. The operation was performed by doctors in 28 (74%), paramedical personnel in 9 (20%), and by the traditional circumciser in one (3%) of the dead boys. Sixteen (57%) of doctors were general practitioners, 11 (39%) were either surgeons, or urologists and one (4%) was internist.

In this study, five of the deceased had abnormal examination findings at the time of operation: two boys with signs of pneumonia, one boy with signs of upper respiratory tract infection and two boys with neonatal fever who were not assessed for neonatal sepsis prior to the operation. Also, two deceased patients had past medical histories of other diseases: one with history of febrile seizures and the other with history of meconium aspiration syndrome.

Time interval between surgery and first complication was classified into two groups: first group were the patients who experienced complications during

induction of general anesthesia (5 13%). Second group were the patients who experienced complications during the operation or later after the operation (33 87%). Final causes of death are presented in Table 2.

Circumcision is one of the oldest surgical procedures performed. Ritualistic circumcision has been done in West Africa for over 5000 years and in the Middle East for at least 3000 years.^[8] Currently, about one out of three males are circumcised worldwide,^[2] mainly in the United States, Canada, Middle East region, Indian Muslims, and various countries in South-East Asia and large parts of Africa.^[9] Circumcision has become an essential part in the practice of many religions, particularly Judaism and Islam.^[10] Male circumcision is of public health interest and recent randomized controlled trials have shown that adult circumcision reduces the risk of acquiring HIV infection by about 60%.^[2] The World Health Organization (WHO) and the Joint United Nations Programme on HIV/ AIDS (UNAIDS) recommend neonatal circumcision in addition to adult circumcision as effective longer-term HIV prevention strategies.^[2]

Death from circumcision is an extremely rare occurrence. Cairns reported a case of a misplaced Plastibell ring, which caused complete meatal obstruction resulted in acute venous stasis and subsequent death from sepsis in 2007.^[4] There are other reports in the international literature that describe mortalities from tetanus as a result of circumcisions performed under nonsterile conditions.^[5] The only study which presents the contrary data on the circumcision-related death has estimated that approximately 9.01/100,000 neonatal circumcision-related deaths occur annually in the United States.^[11] This study has been shown to have no credibility, as it was based on an assumption that the difference in

annual death rate between male and female infants was entirely due to circumcision-related deaths. Morris and co-authors in their recent study showed that the sex difference in infant mortality was similar for countries having low and high infant circumcision rates.^[12]

In our study, seventeen provinces reported no deaths over the 10-year study period. This could be explained partly because of the absence of a reliable national data source. Also, according to cultural environment of Iran, it is possible that the parents of the deceased do not complain or even recognize the death as a routine complication of circumcision. So, the reports might under-estimate the true frequency of mortalities.

We report five cases of cardiac arrest due to induction of general anesthesia. A previous US study of circumcision reported no complications from general anesthesia.^[13]

Different methods were reported for pain control or preoperative sedation including: local anesthesia with

Table 2: Final causes of death among thirty-eight circumcision-related deaths during the study period

Final cause of death	Explanation	Number of deaths
Cardiac arrest	Due to induction of general anesthesia	5
Hypersensitivity to local anesthetic agents	Lidocaine solution 2%	12
	Xylocaine	1
Apnea	Using Diazepam and Tramadol as preoperative sedatives	3
	Milk aspiration after the operation	2
	Oral administration of incorrect dosage of Promethazine for the purpose of preoperative sedation	1
Postoperative bleeding	Three-month year old infant who underwent circumcision with ring technique by a general surgeon in the hospital. He died six hours after the operation because of hemorrhagic shock.	1
	Two-month year old infant who was circumcised by a traditional circumciser at the home. He had coagulation disorder (elevated PT, PTT)	1
Other causes	61-days year old infant who was circumcised by a general practitioner in his office	1
	Neonatal sepsis which was confirmed by autopsy	1
Unknown cause	Pneumonia which was confirmed by autopsy	1
	-	9
Total		38

Table 1: Distribution of thirty-eight circumcision-related deaths over the provinces of Iran during the study period. Isfahan and Razavi Khorasan provinces failed to report their mortalities

Circumcision-related deaths	Province
11	Tehran
7	Fars
4	East Azerbaijan, Kerman
2	Gilan, Khuzestan, Markazi, Sistan and Baluchistan
1	Golestan, Kermanshah, Kohgiluyeh and Boyer-Ahmad, Kurdistan
0	Alborz, Ardabil, West Azerbaijan, Bushehr, Chahar Mahaal and Bakhtiari, Hamadan, Hormozgan, Ilam, North Khorasan, South Khorasan, Lorestan, Mazandaran, Qazvin, Qom, Semnan, Yazd, Zanjan

2% lidocaine solution or xylocaine and intramuscular injection of diazepam or tramadol or phenobarbital. Lidocaine was reported as the most frequent local anesthetic agent used for the pain control in our study. According to Table 2, we found 13 cases of hypersensitive reactions to local anesthetic agents. The most obvious message from these results is to not use general anesthesia for circumcision. Local anesthesia is, moreover, all that is needed for this simple, local operation. Most adverse drug reactions (ADRs) associated with lidocaine for anesthesia relates to administration technique or pharmacological effects of anesthesia, and allergic reactions only rarely occur. Several allergic reactions related to this specific type of lidocaine were reported to ADR committee. Therefore, Iranian ministry of health and medical education has forbidden the use of this drug.

Bleeding was reported as the most frequently encountered complication after circumcision by Atiker *et al.*^[14] We report three cases of postoperative bleeding leading to death.

Surprisingly our study shows that most of those who died had been circumcised by doctors. Paramedical persons and traditional circumcisers were reported to cause most of the complications in other studies.^[13] May be that is because the majority of families prefer their male children to be circumcised by physicians. Thus, more recourse of patients to this group and an apparent increase in the number of circumcisions performed by physicians has been observed in the recent years. We thus strongly recommend improvement in the supervision by health authorities of physicians.

In conclusion, male circumcision is commonly practiced and will continue to occur for cultural, health, and medical reasons. There is a clear need to improve safety of male circumcision at all ages through improved training or retraining for both traditional and medically trained providers, and to ensure that providers have adequate supplies of necessary equipment and instruments for safe circumcision. A thorough and complete preoperative evaluation, focusing on the patient age, bleeding history and birth history seems to be necessary as the most effective measure.

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