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Supraventricular Tachycardia in Critically Ill New Born Patients in the Neonatal Intensive Care Unit, Treatment with Electrical Cardioversion Report of Cases and Review of the Literature

Maria Bertha Romo Almanza[1]* and Francisco Javier Sánchez Reyes[2]

[1]*Pediatric Neonatologist, Chief in Charge NICU HMI Guadalupe Victoria, Atizapan de Zaragoza, Edo Mexico*

[2]*Pediatrics Sub Division, Chief HMI Guadalupe Victoria, Atizapan de Zaragoza, Edo Mexico*

***Corresponding Author:** Maria Bertha Romo Almanza, Pediatric Neonatologist, Chief in Charge NICU HMI Guadalupe Victoria, Atizapan de Zaragoza, Edo Mexico.

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Abstract

Introduction: Within the range of alterations that may occur in the perinatal period, we find the phenomenon known as arrhythmias: that is, lack in the regulation or alteration of the frequency of heartbeats or a variety of rhythm disturbances, which may be present in both the intrauterine stage, as in healthy newborns. Considering mostly benign and transient [1] in the pediatric patient can be documented in 1 in 1000 children [2], frequency that varies in the newborn of 1 - 10% during the first days of extrauterine life [1,2]. In critically ill newborns hospitalized in the Neonatal Intensive Care Units, arrhythmias increase their mortality. Being very frequent the presence of tachyarrhythmias, mainly type supraventricular tachycardia

Objective: To identify disturbance of the rhythm type Supraventricular tachycardia, which requires treatment, when it is necessary to use electrical cardioversion.

Methods: Case report and review of the literature.

Conclusions: Although tachyarrhythmias are not very frequent events in the neonatal group, their natural history differs from other age groups, as previously mentioned, supraventricular tachycardias that are mostly benign and occur in susceptible patients, it should be remembered that when it is not possible to reverse the rhythm disorder with conservative and/or pharmacological management, and finding the patient with hemodynamic instability, the use of electrical cardioversion should be assessed, with an electrocardiographic record, and evaluation by pediatric cardiology should be carried out, as well as follow-up and chronic treatment to this patients.

Keywords: *Newborns; Arrhythmia; Tachyarrhythmia; Supraventricular Tachycardia; Cardioversion; Neonatal Intensive Care Unit (NICU)*

Introduction

Within the range of alterations that may occur in the perinatal period, we find the phenomenon known as arrhythmias: that is, lack in the regulation or alteration of the frequency of heartbeats or a variety of rhythm disturbances, which may be present in both the intrauterine stage, as in healthy newborns. Considering mostly benign and transient [1] in the pediatric patient can be documented in 1 in 1000 children [2], frequency that varies in the newborn of 1 - 10% during the first days of extrauterine life [1,2]. In critically ill newborns ho-

spitalized in the Neonatal Intensive Care Units, arrhythmias increase their mortality. Especially when they are associated with structural congenital heart disease or lack of response to medical treatment [1].

Currently there is an increase in the creation of Neonatal Intensive Care Units (NICUs), which leads to greater survival of patients hospitalized there; with close monitoring in prenatal as well as postnatal stages, which in turn allows identifying the different rhythm alterations [1-3].

The surface electrocardiogram being the reference procedure to document what type of rhythm alteration is occurring. And according to the clinical state of the patient, norm conduct to be followed, complementing with cabinet studies [4].

In the perinatal period, arrhythmias can occur by several mechanisms, the most important are: defects in the generation of impulse with increase or decrease of automatism and defects in the conduction of the stimulus with simple or unidirectional block and a mechanism of reentry. For these alterations to occur, there must be a physiopathological substrate in the patient that predisposes to this condition such as: hydroelectrolytic alterations, hypoxemia, immaturity of the autonomic nervous system, myocarditis, congenital heart disease or central venous catheters that irritate the endocardium [1,3].

Tachyarrhythmias: abnormal increase in heart rate, considered as benign when there is no clinical hemodynamic repercussion and does not require any treatment. Just as it is not necessary to follow up since they do not affect the state of health.

Malignant tachyarrhythmias: have hemodynamic repercussion, require treatment and follow-up.

This time we will talk about supraventricular tachycardias.

	Frequency or incidence	Electrocardiographic alteration	Clinical	Etiology
Supraventricular extrasystoles	5 - 30% of newborns	Early atrial depolarization with abnormal morphology	Asymptomatic usually, Benign Healthy heart patients	Use of sympathomimetic amines such as dopamine or central catheters that cause mechanical irritation [2,5]
Atrial ectopia	No data	Tachycardia with narrow QRS complex and abnormal P wave with vivariate morphology, or may have a single ectopic focus	It may be asymptomatic or in atrial rhythm greater than 200 bpm and accelerated ventricular conduction = cardiac insufficiency and dilated cardiomyopathy [6]	Increase in the automatism of a group of atrial cells that are not part of the normal conduction system [6]
Atrial ventricular reentrant tachycardia	1 out of every 1700 newborns (0.1%-0.3% of the population in general)	Tachycardia with narrow QRS complex, retrograde P wave, enrolled after the QRS complex Delta wave in the WPW	Syndrome Starts with extrasystole that can be atrial or ventricular, causes unidirectional block usually in the accessory pathway or present in atrioventricular node, Asymptomatic generaly	Requires accessory pathway that can lead in an antegrade or retrograde manner (Wolff-Parkinson-White syndrome WPW) [2,7]
Atrial flutter	25% of fetal tachycardia	P wave pattern in the form of "sierra" with frequencies of 300-600 beats per minute	Regular or irregular ventricular response, high morbidity and mortality, with response to pharmacological rhythm treatment, good long-term prognosis	It is associated with congenital heart diseases, chromosomal alterations and other pathological conditions [6-8]

Table 1: *Types of supraventricular tachyarrhythmias.*

In the year 2018 in the Guadalupe Victoria Maternal and Child Hospital, there were a total of 3585 births, of which 8.8% required hospitalization in the NICU area for different reasons, with the main Prematurity (71.4%) with ages ranging from 26 to 36 gestation weeks. Making patients with this condition more vulnerable to multiple complications. (28.6% were patients older than 37 weeks of gestation).

Clinical Case 1

Patient HPQ female, product of the gesta 3 mother 38 years old, with adequate prenatal control, normal ultrasound, presents premature rupture of membranes in week 29 and anhydramnios is interrupted via cesarean, at 29 weeks of gestation, obtaining preterm product, birth weight 1170 grams, Apgar 8/9 habitual resuscitation maneuvers, admission to intensive neonatal therapy with application of orotracheal surfactant, and phase III ventilation, during their stay, requires placement of central venous access, initially onfaloclisis later right internal jugular venous dissection with diagnosis of sepsis neonatal plus endocarditis at day 51 of life and stay, supraventricular tachycardia with heart rate greater than 220 beats per minute and with hemodynamic compromise, characterized by generalized pallor, capillary refill greater than 3 seconds, decrease in saturation 83-85% and without palpating peripheral pulses, with Electrocardiogram in sinus rhythm, no response to vagal maneuvers (cold compress on face) did not have adenosine, electrical cardioversion was applied at a dose of 1 joules per kilogram of weight, with a positive response, 166 beats per minute, heart rate was restored, achieving hemodynamic compensation, in that moment without hydroelectrolytic imbalance. It is assessed by Pediatric Cardiology, an echocardiogram with presence of vegetation in the right atrium is performed, also integrating a diagnosis of endocarditis, otherwise situs solitus, levocardia, normal systemic and pulmonary venous returns, that is, without anatomical alterations. Without presenting a new tachyarrhythmia event, complete treatment and discharge at home upon completion of basic pathology treatment, being followed up in the corresponding subspecialties.

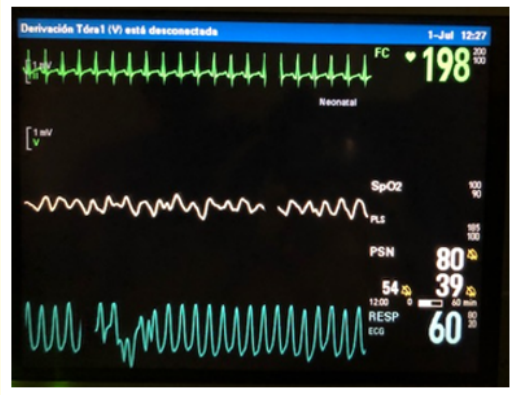

Figure 1: *Monitoring of supraventricular tachycardia without hemodynamic repercussion. Newborn 10 days of life 29 weeks of gestation and neonatal sepsis.*

Clinical Case 2

Patient VG male Product of pregnancy 4, Abortion 1, Caesarean section 3, mother 31 years old, with Purpura Idiopathic thrombocytopenia, in treatment with steroid, with pulmonary maturation scheme, mother with data of severe pre-eclampsia, so pregnancy is interrupted via cesarean, with a single product of 33 weeks of gestation, weight 1650 grams, Apgar 7/9 enters the NICU, with a diagnosis in addition to respiratory distress syndrome modified by surfactant, is placed venous and arterial onfaloclisis, later during his stay is documented hemorrhage of grade I right choroidal plexus, neonatal sepsis, necrotic enterocolitis, then the percutaneous catheter is placed,

the previous one withdraws, suffers with supraventricular tachycardia with heart rate greater than 200 beats per minute, electrocardiographic tracing with sinus rhythm, without hemodynamic compromise, and without response to maneuvers vagal, drug cardioversion is performed with Amiodarone: impregnage 5 milligrams kilo, and then maintenance dose 10 milligrams kilo, achieving stable heart rate, is then assessed by pediatric cardiology, finding by foramen ovale permeable echocardiogram, expected by their life days, otherwise heart structurally without alterations, continuing management with propafenone 9 milligrams kilo day, already without presenting new event of alteration of the cardiac rhythm. Complete treatment, and home delivery with antiarrhythmic drug, and appointment to follow-up in outpatient consultation of the various specialties.

Clinical Case 3

Patient SM male, pregnancy product 2 mother 27 years old, Caesarean section 2, with adequate apparent prenatal control, but there are no cultures, who attends with preeclampsia with severity data, so that pregnancy is interrupted via caesarean section, obtaining preterm product 36.1 weeks of gestation, in whom regular resuscitation maneuvers are performed, Apgar 8/9, birth weight 2,700 grams, ventilatory deterioration and requiring ventilation phase III, and admission to the NICU area, with diagnosis in addition to Congenital Pneumonia, Neonatal Sepsis, Mixed shock, Metabolic Acidosis, is placed onfaloclisis initially, later central catheter, on day 23 of life has supraventricular tachycardia of sudden onset increasing frequency up to 220 beats per minute without response to vagal maneuvers, and adding hemodynamic commitment, it is decided Electric cardioversion with initial dose of 1 joules per kilo, without getting an answer, 2nd is given Discharge to 2 joules per kilo of weight, recovering adequate rhythm and disappearing hemodynamic commitment. Electrocardiogram with sinus rhythm, is evaluated by Pediatric Cardiology, and structurally sound heart is documented. Treatment ends for basic pathologies and an appointment is made to follow up on their discharge in outpatient consultation by the corresponding subspecialties.

Discussion

Acute treatment of supraventricular tachyarrhythmias without hemodynamic commitment

It depends on the general condition of the patient, in those cases of tachycardia with narrow QRS complex, without hemodynamic compromise, vagal maneuvers are started, placing cold compress on the patient's face for 10 - 20 seconds (eyes compression, carotid massage is not recommended), since they can decrease sympathetic activity). The patient should be kept electrocardiographically monitored and blood pressure recorded, due to the risk of asystolia at the end of the rhythm disorder described above [6,7,9].

If treatment with vagal maneuvers is not effective, pharmacological cardioversion is recommended: Adenosine dose 50 - 150 micrograms per kilo of weight initially, the dose if required can be increased from 50 micrograms per kilogram per minute to a maximum dose of 250 to 500 micrograms per kilo of weight and continue with antiarrhythmic drugs. Amiodarone impregnation dose: 5 milligrams per kilo of weight in 1 hour intravenously, continuing with maintenance dose 10 - 15 milligrams per kilo per day [9].

Treatment of supraventricular tachyarrhythmias with hemodynamic commitment

If, despite conservative and pharmacological treatment, tachycardia persists with hemodynamic instability of the patient, cardioversion electrical is indicated. When applying current, the defibrillator equipment must be synchronized with the QRS complex and start with a dose of 0.5 - 1 joules per kilogram of weight [9,10], increasing if conditions require it. Since in most cases this procedure is effective to reverse the tachyarrhythmia.

Chronic treatment

In newborns with a history of supraventricular tachycardia, after resolving the acute event, maintenance treatment should be left to avoid recurrence because they are susceptible patients: digoxin, B blockers (propranolol) are the first line agents in reentrant tachyarrhythmia. Antiarrhythmics class IA (procainamide), IC (propafenone or flecainide), Class III (Amiodarone) when the previous ones are not effective [9,10].

Conclusions

Although tachyarrhythmias are not very frequent events in the neonatal group, their natural history differs from other age groups, as previously mentioned, supraventricular tachycardias that are mostly benign and occur in susceptible patients, it should be remembered that when it is not possible to reverse the rhythm disorder with conservative and/or pharmacological management, and finding the patient with hemodynamic instability, the use of electrical cardioversion should be assessed, with an electrocardiographic record, and evaluation by pediatric cardiology should be carried out as well as follow-up and chronic treatment to said alterations.

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