

Temporary neonatal atrial pacing through the umbilical venous route: A novel technique

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ABSTRACT

Atrial pacing in the neonate is rarely done due to constraints of equipment, technical knowhow, and risk of complications. We describe a novel method of atrial pacing in the new born using equipment readily available in any intensive care unit. Atrial pacing can be achieved using an adult bipolar pacing wire directly introduced through the umbilical venous route. We have used this method in 5 neonates, and achieved atrial capture in 4 patients. Temporary atrial pacing is a therapeutic option in a few neonatal arrhythmias, such as atrial flutter, a few types of re-entrant tachycardias, such as accessory pathway mediated tachycardia and junctional reciprocating tachycardia, and has a limited role in cardiopulmonary resuscitation where sinoatrial node dysfunction is suspected.

Keywords: Arrhythmias, atrial pacing, cardiopulmonary resuscitation, neonate

INTRODUCTION

Neonatal pacing during certain arrhythmias or emergency resuscitation is underutilized because of lack of requisite catheters and access devices. Small-sized pacing wires that could be introduced through 4F or 5F sheaths are not readily available. Nor are transcutaneous pacing devices or esophageal pacing systems readily available. The adult pacing wires are 5F or 6F sizes and require 7F and 8F sheaths, respectively, which are not possible to be introduced in a neonate through the femoral or jugular routes.

We describe a technique where the umbilical venous access was used to directly introduce the 5F or 6F standard bipolar pacing wire to achieve atrial pacing in neonates up to 3 weeks of age where emergency pacing was required [Figures 1 and 2]. This method does not require any access devices or sheaths. It is done the same way an umbilical venous catheter is introduced, but requires a little more care as the pacing wire is stiffer. The umbilical cord is premoistened with normal

saline and then painted and draped as per standard protocol. The bipolar pacing wire, generally 6F, is introduced after cutting the umbilical cord at the base and identifying the opening of the umbilical vein. The wire is introduced slowly and gently, rotating it slightly if resistance is encountered before reaching the right atrium. Confirmation of placing is achieved by the presence of atrial capture rhythm on the pace maker and achieving successful pacing beats by setting the atrial rate higher than the spontaneous rate. It is primarily a blind emergency procedure, which can be done at the bedside without requirement of any fluoroscopic or echocardiographic guidance. Ventricular pacing is not possible due to the fact that the pacing wire cannot be manipulated across the tricuspid valve while using the umbilical route. Also this method would be useful only up to the initial few days of life, before the umbilical cord stump dries up. Although we did not experience any complications of the procedure in our 5 patients, it is possible that vascular damage or tear can happen if any undue force is applied during wire placement. Also other complications, such as infection and thrombosis are theoretically possible.

We have done the procedure in five neonates till now, smallest being 1.2 kilograms and 32 weeks of gestation. The oldest age of the child that we could do the procedure was a term neonate 20 days of age, weighing 3.4 kg. Indications varied from sinoatrial node dysfunction due to metabolic disturbances and posthypoxic arrhythmias. One procedure had to be abandoned due to inability

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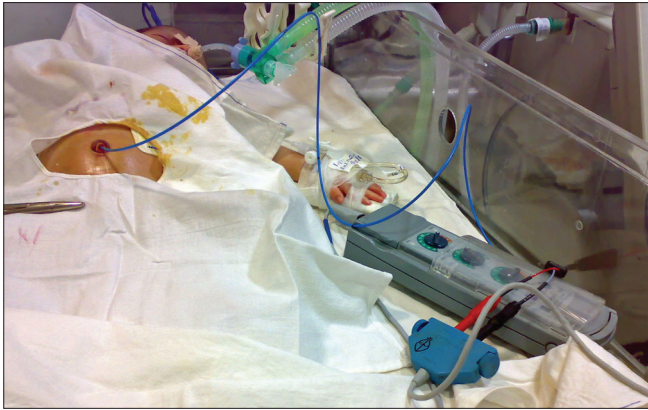


Figure 1: 6 French pacing wire inserted through umbilical venous route

to advance the pacing wire up to the atria. In the 4 successful placements, we could achieve atrial capture in all four.

DISCUSSION

Temporary atrial pacing is an option in a few neonatal arrhythmias, such as atrial flutter, and other forms of re-entrant tachycardia, such as accessory pathway-mediated tachycardia and permanent form of junctional reciprocating tachycardia.^[1,2] Overdrive atrial pacing using rates higher than the flutter rate is a standard treatment modality well documented and effective in most cases.^[3] Also there are instances during cardiopulmonary resuscitation where atrial pacing may help, for example, in sinoatrial node dysfunction or depression due to metabolic cause,^[4] or in a postasphyxia scenario.^[5]

Our method of atrial pacing is possible with the use of readily available adult pacing wires and pacemaker, and does not require any special equipment. It can be done quickly and with absolute safety if routine asepsis measures are followed as in any central line placement. It would be possible to get the same benefits if transcutaneous or esophageal routes are used, but both of these methods require special equipment and are considerably expensive. Umbilical venous route for neonatal atrial pacing has not been described until now and presents a novel therapeutic method to neonatologists and cardiologists.

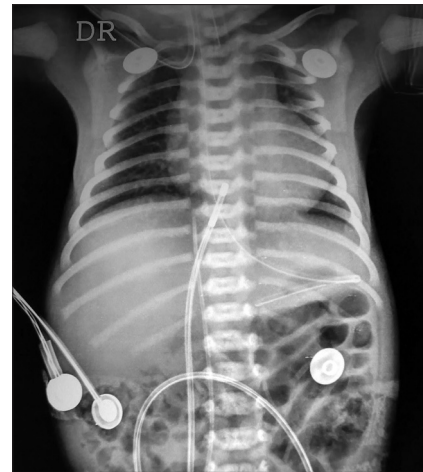


Figure 2: Radiograph depicting the pacing wire with the tip correctly positioned in the right atrium

CONCLUSIONS

We describe a novel method of transumbilical venous route of atrial pacing in neonates using 6F sized pacing wire, which can be done bedside as an emergency procedure without requiring special skills or equipment.

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