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Research Article

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Comparison NAVA mode ventilation vs PSV & CPAP mode of ventilation / in children with neonatal RDS/

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Abstract

Background: The potential of NAVA is to adjust to the babies' efforts for ventilation and reduce Ventilator Induced Diaphragm Dysfunction. [1] This action is based on the continuous coupling between the patient´s neural output and ventilator assistance. In contrast to Pressure Support ventilation, where a gradual increase in the assist level will abolish the electrical activity of the diaphragm, an increase in the NAVA level will unload the muscle but still maintain muscle activity.[2] Hence, over-assist by Pressure Support will function as a semi-controlled mode where the patient may be triggering the ventilator, by a small activation of the intercostal muscles resulting in a large tidal volume delivery. In contrast, NAVA will maintain the same tidal volume and physiologic diaphragm activation with the degree depending on the NAVA level set [3].

The standard modes include PSV and CPAP modes

Comparison of NAVA mode with standard respiratory support in children with neonatal RDS

Describe clinical characteristics, respiratory parameters and subjective signs of comfort during treatment in patients in the described two groups of ventilation in the neonatology department of the second Sheinovo Hospital- Sofia.

This is a prospective study of cases in the two groups described

Including Criteria: Ventilated patients in two groups, with a subject of detailed pathology and available to breathe spontaneously

The cases till now 22 cases were processed in two groups

Exceptions are ventilated patients with asphyxia, aspiration syndrome, and neurological signs

Comparison of:

NAVA invasive mode * PSV

NAVA non-invasive ventilation * CPAP

Report On The Quality Of Synchronization And Comfort

Synchronization with the apparatus- with the following signs hours of calmness and sleeping / without an alarm on the monitoring system/, the presence of tachydispnea. We use the Index of a synchronization - The asynchronous index [AI]. It is calculated as the number of cycles with a visible desynchronization /auto-triggering, insufficient spontaneous breathing, double triggering, short breathing cycle/ divided by the number of synchronized cycles, calculated at the rates per unit time according to the index of respiratory effort, calculated as the ratio of the Edi / TIn for each respiratory cycle during the observed 15-minute period the number of cases of reintubation or changing of the mode of ventilation

Materials and methods: Clinical experience in the Neonatology Department till May 2018

Conclusion: Registration of the advantages of the invasive NAVA mode at low gestational age and spontaneous respiration of more than 20%, exceptionally good effect on post- extubation patients in both modes of non-invasive ventilation, a clear advantage of full-term patients with extra alveolar gas collections from the non-invasive Nava mode during recovery.

Keywords: Neonatal RDS; NAVA ventilation,:Noninvasive respiratory support

Ventilation quality signs Goals: Comparison of NAVA mode principles with conventional respiratory support in newborns with RDS- how to do that? The clinical characteristics description of the respiratory cycle parameters – which of them? To find out the signs of comfort during ventilation support in neonates- what they are?

A case-control prospective study

We used the clinical experience in the Neonatology Department till May 2018

We defined two lines of comparison

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NAVA invasive mode * PSV/ SIMV/ SIPPV

NAVA non-invasive ventilation * CPAP/ NIV

Ventilated patients were separated into the specified groups, with various pulmonary pathology, and insufficient spontaneous breathing available. Patients with severe asphyxia, aspiration syndromes, and neurological lesions were excluded

Where did we start: With the comparison of conventional mode we used routine. Finding optimal comfortable level feeling for the patient. Detection cases in which NAVA mode is not appropriate. What we want to do with mechanical ventilation /MV/ in general: Gas exchange /-/ CO2 /+/ O2. Oxygen delivery to the patient's lung and CO2 elimination out of the respiratory system. Respiratory failure treatment or spending time during the therapy when other current conditions are the primary reason for respiratory failure. During the asphyxia or other neurological impairment, we use the conventional mode of ventilation in that case patient is not available to breath

Used devises for oxygen delivery, in general, are O2 tent, O2 nasal prongs, CPAP, HFNC, invasive/ noninvasive ventilation with PSV * SIMV* PC* NAVA

Accordingly, with frase "Primom non nocere"- minimal handing cares is a prior method to use with minimal use of invasive technics, as follows: Trying to avoid lung overdistention; setting optimal target values for blood gases; using suitable equipment; application of fluid and caloric support in optimal level; antiseptic method of work. As a result of the conditions listed here to receive optimal "interaction" between patient and ventilator [4]

NAVA – basic concepts

The first time described Sinderby's group 1999r. A sensor inserted into an adapted nasogastric probe picks up a neurological signal from the electrical activity of the diaphragm. In the conditions of NAVA®, the frequency, and depth of breathing are determined by the patient. Maintain the same Tidal Volume /Vt/ and physiologic. Diaphragm activation with the degree depending on the NAVA level set synchronized with Edi signal. The pressure support /PS/ is proportional to the amplitude of the Edi signal. The EDI signal is given every 16msec, so the respiratory cycle is synchronized both throughout its duration and between breaths [16]

We selected the appropriate Edi catheter size for each patient. The Edi catheter is for single use only. Each Edi catheter we used for up to 5 days. The level of insertion in neonatal patients we set up according to the Edi trigger level [5,6]The appropriate Nava level varies for different patients as they require different levels of care. It may also need correction over time in the same patient – (Figure 1)

Nava level is a proportional factor that covers the Edi signal into a pressure. When the NAVA level is high – more work for the ventilator. When the NAVA level is low – more work for the patient. Goal-enough mechanical assist without over assist. The ventilator responds patient's respiratory drive by supporting the patient's respiratory effort. WE need to increase the NAVA level until there is no longer an increase in the average P-peek pressure. The desirable effect is a clinical improvement with minimal patient work of breathing [K. S. Firestone, H. Stein Workshop Verona 2018 [17]

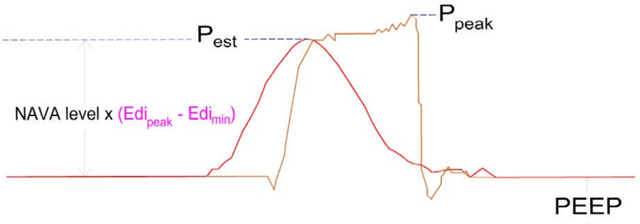

Figure 1: The appropriate NAVA level.

Points of attention in synchronization during providing mechanical ventilation

To optimize the interaction of the patient device couple, we use the rules familiar to us, observe C/ compliance/ and R /resistance/, calculate Tc / Time constant/, and determine the desired level of oxygenation. We maintained adequate volumes following known or suspected respiratory pathology and set a limit of P /Pressure/, F /frequency/, and FiO2 fraction of oxygen in delivered gas. Synchronization of the volumes with trigger mechanisms adapted to, most often, the beginning of the RC / respiratory cycle/. When the Pressure Support level is too high:- a risk of overdistention. When it is too low- risk of hypoventilation. The setting of the optimal trigger level- If we set too high a level of sensitivity- there is a risk of auto-triggering. If we set too low a level of sensitivity- there is a risk of wasted effort.

Setting the optimal end of the inspiration [cycle off], If % timing is set too long- there is a risk of asynchrony. If It is too short- risk of double triggering [7] (Figure 2)

Is there a pilot in the plain?

Integrated trigger systems are based on measurements of chest impedance, pleural space, and airway pressure or flow triggers. These trigger systems capture the start of breathing and synchronize the respiratory cycle [applies to Pressure Control /PC /or cyclic during limited ventilation pressure] or [with PSV]. [[Howard Stein et al.] A trigger system, most often used in newborns is at the beginning of the flow in the respiratory tract. [NAVA] is a mechanical ventilation mode that assists in the hall respiratory cycle and proportion to the electrical activity of the diaphragm [Edi] synchronously on each inhalation [6]. Edi is also a control signal for the pressure level applied during inhalation, the pressure is controlled according to the curve [Edi] of the signal, according to standardized algorithms, and proportionally a coefficient called NAVA level, which is adjusted by the operator according to the desired effect [18] [8] (Table 1).

[Howard Stein et al. [5][Synchronized Mechanical Ventilation Using Electrical Activity of the Diaphragm in Neonates- Howard Stein, MDa, Kimberly Firestone, BS, Peter C. Rimensberger, Workshop in Verona 2018 [19]

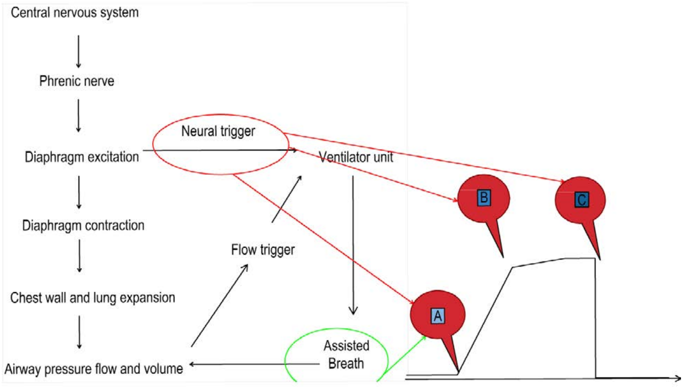

Figure 2: Triggering level of NAVA.

Table 1: A table for triggers controls and type of synchrony in conventional modes and NAVA mode.

	CV	NAVA
Trigger	➢ Start of breath ➢ Rate +/ - ➢ Based on a patient's efforts	➢ Start of breath- based on a patient's drive ➢ Rate ➢ T in ➢ PIP ➢ End of breath
Controles	➢ PEEP ➢ FiO2 ➢ PIP/ Vt ➢ T in ➢ T ex/ duration of the breath cycle	➢ PEEP ➢ FiO2 ➢ NAVA level
Synchrony	➢ Start or breath	➢ Start or breath ➢ Size of breath- PIP ➢ Duration of a respiratory cycle

Improvement of patient-ventilator synchrony with NAVA

With NAVA, the patient controls all the levels of the respiratory cycle the initiation and termination of breaths, the inspiratory time, expiratory time, and respiratory rate. The breaths are generally initiated when the Edi level reaches 0.5 Vt above the Edi minimum and terminated at 70% of the Edi peak. The rise to the inspiratory plateau and height of the plateau is in proportion to the Edi- signal, and largely reflect the patient's efforts and personal needs]. NAVA is associated with improved patient-ventilator synchrony, and marked reduction of ineffective effort, premature or late cycling, as well as premature and delayed cycling off [4] [9] [10] [11] [12] In reality, synchrony between the patient and ventilator is complex and can be affected by the ventilator settings, type of ventilator, patient-ventilator interface, and sedation. Several types of asynchronies have been defined, and asynchrony during invasive and noninvasive ventilation. There is a clear association between asynchrony, ventilator-induced diaphragmatic dysfunction, and the duration of mechanical ventilation. Whether these are cause and effect or simply associated remains to be determined. [13]

NAVA works for lung protection strategies through adjusting NAVA level, Trigger Edi, and setting the alarm limits. In PC mode of ventilation. The tidal volume /Vt/ will increase accordingly assist level increase. On NAVA mode the patient chooses Vt. Accordingly, increasing NAVA level leads to a Vt increase and stop depending on the Edi peak that we set[2.1] (Figure 3)

There is evidence from numerous studies that NAVA effectively unloads the respiratory muscles and provides synchronous ventilation[14].

Edi signal is the vital sign of respiratory monitoring. Mechanical ventilation will interact with the control system of the respiratory centers, with an excess of mechanical ventilatory assistance leading to dissociation between the respiratory centers and the mechanical insufflation of the lung. At medium levels of Pressure Support, this is frequently seen as neuro-ventilatory asynchrony manifests by missed patient efforts [no trigger response from the ventilator upon neural and diaphragm activation]. [2.3]

To compare how it happens with the patient, every one of them is considered a suitable operation mode for him before inclusion in the study (Table 2 ,3)

We choose to take three periods of time 15 min long to register variable (Table 4)

Missed effort- With wasted effort [ineffective triggering] the patient has an inspiratory effort and the ventilator fails to trigger 2.

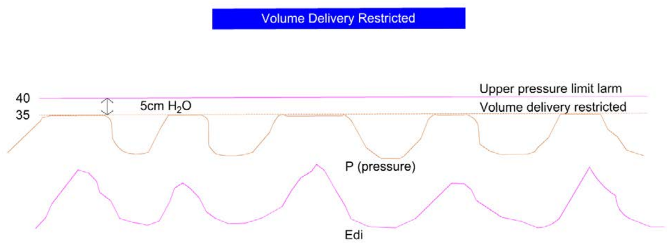

Figure 3: Volume delivery.

Table 2: Who to ventilate.

❖ Study protocol: Pilot prospective
❖ INCLUSION CRITERIA: Ventilated patients with RDS who are available to breathe spontaneously at the moment of inclusion in the study
❖ Slabile hemodynamics
❖ O2 needs variations
❖ The presence of abdominal distension or a trace of an extra alveolar gas collection was acceptable
❖ 22 cases have proceeded in two groups
1. NAVA invasive mode after application of PSV
2. NAVA non-invasive ventilation instead of CPAP- ventilation

Table 3: Application of NAVA – patient pattern.

❖ Birth weight – 500 g- 3800 g (average 1790)
❖ Gestational age 24,4- 39, 6 w. g.(average 31.6)
❖ Gender 66.7%- boys (N= 15)
❖ Surfactant application in 72 % of cases- 16
❖ Type and severity of pulmonary pathology
❖ Concomitant diseases
❖ Days before switching mode or stopping ventilation
❖ Oxygen needs and ventilator parameters

Table 4: Signs or Synchrony.

❖ Assessment of the NAVA effect
❖ Sequential change of invasive modes to the same baby to NAVA* CMV for 15 min
❖ Choosing three 3- hours periods during the day (the same for each baby) as in the first 15 minutes to register the same indicators
❖ N.B. Modes of MV can be compared with various respirators, even without NAVA if only an Edi catheter is placed
❖ Video recording with webcams to account for periods of asynchronism

Auto trigger-Assist is initiated from the ventilator, but there is no inspiratory effort from the patient. 3. Trigger delay- The ventilator starts delivering assistance after patient effort 4. Double triggering:

continued patient effort following the breath delivery, resulting in a second triggered breath 5. Reverse triggering: activation of respiratory muscles by mandatory, Time-triggered breaths [20].

Flow Delivery

1. **Flow mismatch or flow asynchrony [patient demands ventilator**

output]: volume control 2. Insufficient pressurization rate [rise time too slow]: pressure support 3. Mode asynchrony: active effort during adaptive pressure ventilation, resulting in insufficient support: use of intermittent mandatory ventilation with interspersed volume and pressure breaths, precluding sufficient respiratory muscle unloading [20].

Timing

1. End inspiration delay- When the patient has finished inspiration and switches to expiration, the ventilator continues to deliver assistance during expiration. Premature cycling: neuromechanical asynchrony 2. Early inspiration- The ventilator ends the breath before the end inspiration of the neural inspiration [the Edi] inspiratory time shorter than the neural inspiratory time 3. Late cycling: neuromechanical asynchrony: mechanical inspiratory time longer than neural inspiratory time [13] (Table 5,6 and 7)

Patients

We have 22 children with RDS in most of the cases end every one of them with respiratory failure. Number of patients= 22. Females= 10 = 45%; males 12 = 54%. ; Mode of ventilation before NAVA 22 patients 68 days on SIPPV- 45%, SIMV- 22,7 %, PSV – 13,6%, NCPAP- 18,1. 171 days after their separation into two groups- with and without NAVA. 10 cases on NAVA= 45%. 16 with surfactant application. (Table 8)

Table 4 A : AI.

AI %= N asynch events/ RRx 100***[N asynchr events/ 100]x RR= AI%

Table 5 :

The patient's interaction improves, as can be seen from the low number of asynchronism and the absence of wasted efforts, the low number of asynchronous moments per minute compared to PSV.

Distribution of the patients according to the diagnosis. two premature babies after extubation, with higher than a usual decision on extubation parameters, with FiO2 0.6 and Pin code 20, with spontaneous respiration by more than 20% with good effect, and two more children with extra alveolar collections - chylothorax from CoAo / Coarctatio Aortae/ and hydrothorax from extravasation to CVC. We launched the non-invasive NAVA mode a little boldly with repeated, already treated pneumothorax due to the retention of high oxygen needs. On the very right side is the % of all the diagnoses with surfactant (Table 9) (Table 10)

%. PN- 3 / 13,6%,/, RDS – / 54%/, PHA – 1 / 4,5% /, PDA 2 / 9%/, PH 2/ 9%/, Hylothorax 3 / 13.6%/, KoAo 1/ 4,5%/, AS 2 / 9%/. (Table 11) (Table 12) by the gestational age

P- peaks are estimated with NAVA level 1.6+/- 1.0 (Table 13)

Calculation on AI

MV days N =239

MV days before study N =68

MV days observational period N= 171

Obs. 15 min N= 906

An observational period in min N= 7 695

Total A- moments per minute = 6.4

We count the MV days number- total, before and during the study; The observational period in minutes, and the number of asynchronous moments(Table 4,5& 6)

Observation- the others

The incidence of asynchrony during invasive ventilation is presented by missed triggers, they are the most common asynchrony type. The presence and severity of asynchrony are associated with

Table 6: The primary results.

Patient-ventilator relationship	NAVA *inv Days N= 18 N min= 810 RR= 45	NAVA *NIV Days N= 46 N min= 2 070 RR= 62	PSV* SIMV*SIPPV Days N= 88 N min= 3 960 RR= 68	CPAP* Days N= 6 N min= 270 RR= 50
Trigger async	82	199	129	14
Flow async	16	140	21	3
Wasted efforts	0	0	8	7
Count of AP per 1 min**IA	8.26** AI 3.87%	6.1** AI 3.7 %	25.6** AI 17.04%	11.5** AI 5.75%
WOB* Pin x Vt	Working process			

Table 7: Ventilatory parameters for starting respiratory support .

	SIPPV	SIMV	A/ C	PSV	NAVA inv	NAVA NIV
Ti	0, 28- 0. 40	0, 28- 0. 40	0, 2- 0, 4	0.3- 0. 4	Back- up 0, 3- 0, 5	Back- up 0, 3- 0, 5
RR	According to DG < 60	According to DG < 60	25-110	25- 60	Back- up 30	Back- up 30
PIP/ or Pi ab. PEEP	To estimate Vt	Vt	Vt	Vt	-	-
PEEP	4-8 ac. O2 needs, clinical condition	4- 8	4- 8	4- 8	2- 4	2- 4
Vt	4- 6 ml/ kg	4- 6 ml/ kg	4- 6 ml/ kg	4- 6 ml/ kg	-	-
Flow	3- 5 l/ min	3- 5 l/ min	3- 5 l/ min	3- 5 l/ min	-	-
FiO2	According to FiO2 and clinical condition	According to FiO2 and clinical condition	According to FiO2 and clinical condition	According to FiO2 and clinical condition	According to FiO2 and clinical condition	According to FiO2 and clinical condition
NAVA level	-	-	-	-	0, 5- 3. 0	0, 5- 3. 0

Table 8: Patient's characteristics.

N	Gender	BW	W.G.	Start of MV mode +/- curosurf	N of days before NAVA	Total days of MV	Dg	FiO2	NAVA +/ -
1	F	3800	38	SIPPV-	1	3	PN	60	No
2	M	1090	28	SIPPV+	4	16	RDS	60	No
3	F	1100	27	SIPPV+	4	21	RDS	45	No
4	M	1200	29	SIPPV+	3	10	RDS	50	NAVA
5	F	2360	26	SIPPV+	1	8	P	50	No
6	M	670	24,8	SIPPV+	6	23	RDS, PDA	45	No
7	M	1060	30	PSV+	4	16	RDS,hydrothorax	45	NAVA
8	M	1260	29	SIMV+	3	12	RDS	45	NAVA
9	M	520	24,4	SIPPV+	10	29	RDS, PDA	55	No
10	F	820	31	SIPPV+	10	20	SAH	45	Ex. Letalis
11	M	1090	32	SIPPV+	4	13	PH	40	no
12	M	1320	31	PSV+	4	11	RDS, CoAo, Hydrothorax	40	NAVA
13	F	3000	36	SIMV+	1	6	AS	65	no
14	F	3000	35	PSV-	2	7	PH	60	NAVA
15	F	2580	34	NCPAP	1	5	PH	45	NAVA
16	M	1220	31	SIMV+	2	12	RDS	50	NAVA
17	M	1600	32	SIPPV+	1	6	RDS, ICH	40	Ex. Letalis
18	F	1400	30	SIMV+	1	7	RDS	35	NAVA
19	F	1900	33	NCPAP	1	4	PH	45	no
20	M	2100	32	SIMV+	2	5	RDS	40	NAVA
21	F	3080	36	SIMV-	2	3	RDS, chylothorax	45	NAVA
22	M	3300	37	SIMV-	1	2	AS	50	no

RDS(respiratory distress syndrome); PHA- PFC (perinatal asphyxia- persistent fetal circulation); PDA- (persistent ductus arteriosus); PH(pulmonary hemorrhagia); CoAo(Coarctatio Aortae); AS(Aspiration syndrome); SAH(subarachnoidal hemorrhagia); ICH (intracranial hemorrhagia);

Table 9: Total number of patients.

Disease	Number
Pneumonia	3
RDS	12
PNA- PFC	1
PDA	2
PH	2
Air leaks	3
CoAo	1
AS	2

RDS(respiratory distress syndrome); PHA- PFC (perinatal asphyxia- persistent fetal circulation); PDA- (persistent ductus arteriosus); PH(pulmonary hemorrhagia); CoAo(Coarctatio Aortae); AS(Aspiration syndrome)

Table 10: Number of patients on NAVA.

Disease	Number of cases with NAVA app
Pneumonia	2 20%
RDS	7 58%
PNA- PFC	- 0%
PH	1 50%
Air- leaks	3 100%
CoAo	1 100%
AS	- 0%

RDS(respiratory distress syndrome); PHA- PFC (perinatal asphyxia- persistent fetal circulation); PDA- (persistent ductus arteriosus); PH(pulmonary hemorrhagia); CoAo(Coarctatio Aortae); AS(Aspiration syndrome)

Table 11: Distribution of the patient's gestational age.

W.G	N
24.4- 27.0	3
28.0- 31.0	8
32.0- 34.0	5
35.0- 38.0	6

Table 12: Distribution of patients by gestational age on the.

W.G.	Number on NAVA / %
24.4- 27.0	- /0%
28.0-31.0	- 6/ 60%
32.0- 34.0	- 2/ 20%
35.0- 38.0	- 2/ 20%

Table 13: Here we show the Saturation levels, blood oxygen level (SpO2), heart rate, FiO2, respiratory volume - Vt or average, and peak pressure (PIP* PAP* PIP) during NAVA, PCV, and PSV and CPAP are taken into account.

Parameter	NAVA*inv	NAVA* NIV	PSV	CPAP
Ppeak	12.5	10.2	12.7	6.5
Vt	8.7	7.2	8.4	4.5
Pmean	7.7	6.4	9.3	5.0
Heart rate	133	136	132	150
TcSatO2	99	98	100	97
Desaturation of TcSatO2 / hour	NO	NO	5	2

P- peaks are estimated with NAVA level 1.6+/- 1.0

prolonged mechanical ventilation, longer NICU stays, and mortality. [13]

Maybe when we improve asynchrony, we can improve outcomes, despite synchrony having no therapeutic effects itself. The presence of leaks is the reason for the prevalence of patient-ventilator asynchrony [11] [13]

Asynchrony index 10 predicted a level of pressure support and the increase of a leak [the greater the leak, the greater the asynchrony index]. Studies in Neonatal and Pediatric Patients have shown that NAVA improved patient-ventilator interaction and synchrony in neonates, even in the presence of large air leaks. When changing from conventional ventilation to NAVA, [15] Studies in neonates on NAVA show: that PIP decreased; Respiratory rate increased in some studies, remained the same, or decreased in others; Blood gases improved on NAVA in most of the cases; Mean airway pressure in all studies shows no change in general; Adverse events – not at all on NAVA; The rate of intraventricular hemorrhage, pneumothorax, or necrotizing enterocolitis - there is no change in one retrospective review [15]

Edi monitoring in neonatal and pediatric patients improved detection of patient-ventilator asynchrony in other ventilatory modes. Studies in neonates on NAVA found a spontaneous mean tidal volume of 6.6 mL/kg [range 5.3–8.7 mL] and a mean respiratory rate of 46 breaths/min [range 35–59 breaths/min] [15].

There is improved patient-ventilator interaction even in the presence of large air leaks. [Beck and colleagues] Neonates in this research were ventilated with conventional ventilation [PSV] and for 20 minutes with NAVA. During NAVA neural expiratory times and respiratory rates were lower. There was no difference between NAVA and NIV NAVA.

A crossover trial in 18 neonatal and pediatric patients comparing flow, pressure, and NAVA-triggered ventilation for 10 minutes each, was unable to show a major difference between pressure and flow triggering during assist control. Neonates ventilated with NAVA were synchronous 91% of the time compared with 67% with pressure and 69% with flow-triggered ventilation. PIP decreased 13% on NAVA and respiratory rate increased. In mean airway pressure or blood gases-was no change. No adverse events were noted during the study [15].

Stein described a neonate with respiratory distress syndrome ventilated on NAVA before and after receiving surfactant. This neonate spontaneously increased PIP during, and for 40 minutes after, surfactant administration. The neonate then spontaneously decreased PIP [self-weaned their ventilator pressures], Edi- peak and Edi- min, and respiratory rate over the next few hours as lung compliance improved. [2]

Observations and results

Difficulties arise due to the need for gastric lavage through a probe with an Edi catheter. NAVA seems to be equally well tolerated by full-term and pre-term infants. None of them had sedation. There is not a single case of non-alveolar gas collections after the inclusion of NAVA. Once include no need to change the mode, we work with NAVA mode only. The non-invasive NAVA mode is tolerated exceptionally well

Conclusions

No number of days on mechanical ventilation is reduced with NAVA. In the absence of spontaneous breathing, NAVA mode is not effective. When the indications are observed, there are no adverse effects. Registration of the advantages of the invasive NAVA mode at low gestational age and spontaneous respiration of more than 20%, Avoiding hypocapnia the patient determines his breathing frequency. The surfactant appears like a determinant of the success of NAVA. Earlier extubation of patients with high oxygen needs, which do not allow stopping ventilation yet. We notice a clear advantage for full-term patients with extra alveolar gas collections from the non-invasive Nava mode during the recovery period when the other noninvasive modes like NCPAP and NIV PSV are unacceptable

NAVA is a mode of ventilation in which both the timing and degree of ventilatory assist are controlled by the patient. Since NAVA uses the diaphragm electrical activity [Edi] as the controller signal, it is possible to deliver synchronized non-invasive NAVA [NIV-NAVA] regardless of leaks and to monitor continuously patient respiratory pattern and drive. Advantages of NIV-NAVA over conventional modes include improved patient-ventilator interaction, reliable respiratory monitoring, and self-regulation of respiratory support. In theory, these characteristics make NIV-NAVA an ideal mode to provide effective, appropriate non-invasive support to newborns with respiratory insufficiency. NIV-NAVA has been successfully used clinically in neonates as a mode of ventilation to prevent intubation, to allow early extubation, and as a novel way to deliver nasal continuous positive airway pressure. The use of NAVA in neonates is described with an emphasis on studies and clinical experience with NIV-NAVA. [7] [2]

Our observation leads to

During the ventilation with NAVA, the physiological scheme of respiration is observed. Triggering is carried out in three places on the curve of the respiratory cycle. Prevents overdistention of the lung and may be other side effects of mechanical ventilation. Once a day we do adjustment of mechanical parameters. Using staff with less experience is possible. Duration of ventilation could be longer, with no worries about air leak and overdistention. We have no data on long-term consequences. The surfactant application prepares the ground for the use of NAVA in two conditions-caffeine in the umbilical cord during resuscitation and its use through INSURE. There is an increase in weight for a shorter time because episodes of asynchronism decrease, children independently reduce their breathing rate, put less effort into breathing, respectively, lose fewer calories. A topic that we would like to include in future studies. There is a physiological feedback ventilation control and there is comfort with every breath. The Edi-signal also creates a field for diagnosing the patient's breathing. We have personally seen that it takes time and training to apply NAVA correctly, but the low degree of invasive impact makes us look forward.

We are the first in the country and at the moment the only ones using NAVA ventilation in our daily practice. Our observations and first attempts are encouraging in terms of comfort for both the patient and the doctor.

Notes/Comments:

Special thanks for the advance online publication on 20 June 2012. doi:10.1038/pr.2012.642 Keenan Research Centre, Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, Ontario, Canada; 3 Department of Pediatrics, University of Toronto, Toronto, Ontario, Canada to which model we worked because in BG we are the only one center using NAVA and our work is in the initial stage

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