



To Find the Order of BCG and Hepatitis B Vaccination Given At Birth

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Abstract

Background and Aims: Pain due to immunisation is unavoidable as all the children have to undergo repeated vaccine injections according to universal immunisation programme against the vaccine preventable diseases. BCG and Hepatitis-B vaccines are given at birth under immunization program. BCG is given intradermally whereas Hepatitis-B is given intramuscularly the present study was planned To find the less painful order of administration of BCG and Hepatitis B vaccine at birth i.e. BCG first followed by Hepatitis B vaccine or vice versa.

Methods: we observed 400 neonates receiving routine dose of Bcg and Hepatitis B vaccine given at birth, 200 in each group with first group receiving Bcg vaccine first and vice versa. Pain was assessed on NIPS scale in both the groups immediately after first injection, at 30 second after first injection, immediately before and after second injection, at 30seconds and 60 seconds after second injections.

Results: NIPS scores at all the intervals of time after start of vaccination as well as combined NIPS score were significantly lower when the BCG vaccine was given first (Group 1) with combined NIPS score 10.54 ± 3.92 as compared to when the Hepatitis B vaccine was given first (Group 2) combined NIPS score 14.54 ± 4.97 (P value of <0.0001).

Conclusion: when BCG and Hepatitis-B vaccines are given in same vaccination session, the BCG should be injected before the Hepatitis-B vaccine to reduce the overall pain perceived.

Keywords: vaccination, neonatal infant pain scale score, neonate, pain, Bcg vaccine, Hepatitis B vaccine, Intra dermal, intramuscular.

Introduction

Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage^[1]. Acute pain is one of the most common adverse stimuli experienced by children, occurring as a result of injury, illness, and necessary medical procedures. Injections for vaccinations is the most common source of

iatrogenic pain in childhood and are administered repeatedly to almost all children throughout infancy, childhood and adolescence^[2]. Pain due to immunisation is unavoidable as all the children have to undergo repeated vaccine injections according to universal immunisation programme against the vaccine preventable diseases. The pain associated with such injections is a source of

distress for children, their parents and those administering the injections^[3]. Pain has short-term as well as long-term adverse effects. Children have adverse physiological, behavioural, endocrinal, immunological and biochemical effects in short term.^[4] Long-term effects of pain are altered pain perception, chronic pain syndromes, and somatic complaints.

Self-report measures are optimal and the most valid for pain assessment but require verbal and nonverbal reports which need a certain level of cognitive and language development to understand and give reliable responses which are lacking in neonates⁽⁵⁾. As neonates cannot verbalize their pain and assessment of pain depend on other responses to pain. Therefore, health care professionals can assess neonatal pain only by recognizing the pain associated neonate's behavioural and physiological responses. There are many such scales which use one or the other pain response to quantify pain in neonates, the most common being the Neonatal Facial Coding System (NFCS), Premature Infant Pain Profile (PIPP) and Crying Requires increased vital signs Expression Sleeplessness (CRIES) etc. the Neonatal Infant Pain Scale (NIPS). Neonatal infantile pain (NIPS) scale used in our study for assessing the pain is a behavioural pain scale, which is a valid, reliable and practical scale for assessing neonatal pain^[6]. The NIPS assesses six behavioural indicators in response to painful procedures in neonates. This noninvasive assessment includes facial expression, cry, breathing patterns, motor activity (arms and legs), and state of arousal. Scoring ranges from 0 to 1 in each category, with the exception of cry, which ranges from 0 to 2. A total score can range from 0 to 7. Neonates and children are given multiple vaccines at a same time by different routes i.e. oral, intradermal, intramuscular and subcutaneous. Parenteral administration of vaccines is mild to moderate painful experience to which children are subjected universally. It is being postulated that first injection given may affect the pain intensity due to the second injection. So, the when the two

vaccines which are given through different routes are to be administered at the same immunisation session, then the sequence in which they are given might affect the overall pain experienced during the procedure⁽⁷⁾. BCG and Hepatitis-B vaccines are given at birth under immunization program. BCG is given intradermally whereas Hepatitis-B is given intramuscularly^[8]. Considering the above said facts, this study was planned so as to determine if the pain response to injections BCG and Hepatitis B vaccine) was affected by the order in which they are given. The purpose of this study is to help to device a less painful method for vaccination, so as to reduce the stress among the children and their parents.

Aims and objective

To find the less painful order of administration of BCG and Hepatitis B vaccine at birth i.e. BCG first followed by Hepatitis B vaccine or vice versa

Material and Methods

The study was conducted at Kamla Nehru State Hospital for Mother and child, a unit of Department of Paediatrics at Indira Gandhi medical College, Shimla. It was a hospital based, randomised parallel group study

Inclusion criteria

1. All full term healthy neonates receiving BCG and Hepatitis B vaccination at birth.
2. Parents consenting to include their newborns in the study.

Exclusion criteria

1. Sick newborns and newborn on any supportive care
2. Preterm and IUGR newborn
3. Newborns with major congenital anomalies

With confidence limit of 95% and absolute error of 10% the sample size calculated was 384. So, 400 neonates meeting our requisite criteria were included in the study. The demographic profile of the all the cases was recorded as per a structured case recording format Table. The newborns were randomly divided into two groups using random

tables. Randomization into two groups was performed by one of the investigators not involved in the clinical aspect of the study. Newborns in the groups were comparable in age, gender, and weight.

Group 1: 200 newborns in this group were given BCG vaccine first, followed by Hepatitis B vaccine 60 seconds later.

GROUP 2: 200 newborns in this group were given Hepatitis B vaccine first followed by BCG vaccine 60 seconds later.

All the infants were dry at the time of procedure. The newborns were laid on the radiant warmer during entire procedure so as to observe pain score correctly. Vaccination was given to the entire neonate at the Brazelton state 3-4 of arousal⁽⁹⁾ and was fed half to one hour prior to vaccination. Same examination room with same radiant warmer and same surroundings was used for all the neonates in a thermo neutral temperature with NIPS of zero prior to vaccination. NIPS score was used to assess the pain in our study. To maintain uniformity the same size needles of same make were used. Vaccination was given in the sequence determined after randomisation, by the same health worker to minimise subjective variation. She was not informed about the outcomes of the procedure and was blinded to the purpose and hypothesis of the study. Standard immunization procedures were used. 0.1ml of BCG vaccine was administered intradermally at the convex aspect of left shoulder using a tuberculin syringe with 0.45x13mm needle⁽¹⁰⁾. 0.5ml of Hepatitis B vaccine was administered intramuscularly at the anterolateral aspect of thigh using 0.60x25mm needle⁽¹¹⁾. Pain was assessed on NIPS scale in both the groups immediately after first injection, at 30 second after first injection, immediately before and after second injection, at 30seconds and 60 seconds after second injections. The data analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0. Statistical analysis of the data was done to find the difference in pain intensity on NIPS scale. Categorical variables were presented in number

and percentage (%) and continuous variables were presented as mean \pm SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used. Quantitative variables were compared using Unpaired t-test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups. Qualitative variables were correlated using Chi-Square test /Fisher's exact test. A p value of <0.05 was considered statistically significant.

Results

400 newborns participated in the study out of which 43.25% were females and 56.75% males. There were two groups of 200 newborns in each group depending upon the order in which the injections were given. Newborns in group -1 received BCG vaccine first and newborns in group-2 received Hepatitis B vaccine first. Demographic profiles of the two groups were as in Table :1.

Mean NIPS scores after BCG vaccination at 0, 30 second and 60secondswere 2.35, 0.92 and 0.1respectively in first group (BCG first) and 2.65, 1.26and 0.32 respectively in group 2 (Hepatitis B first). NIPS scores after BCG vaccine in Group 1 were significantly lower as compared to Group 2 at 0, 30 and 60 seconds Table: 2.

Mean NIPS scores after Hepatitis B vaccination at 0, 30 and 60 seconds were 4.74, 2.08and 0.34 respectively in first group (BCG first) and 5.4,3.36 and 1.36 respectively in group 2 (Hepatitis B first). NIPS scores after Hepatitis B vaccine in Group 1 were significantly lower as compared to Group 2 at 0, 30 and 60 seconds Table :3.

NIPS scores at all the intervals of time after start of vaccination as well as combined NIPS score were significantly lower when the BCG vaccine was given first (Group 1) with combined NIPS score 10.54+_3.92 as compared to when the Hepatitis B vaccine was given first (Group 2) combined NIPS score 14.54+_4.97 (P value of<0.0001) Table:4.

Table:1 demographic profile of the newborns enrolled in two groups

Characteristics/variable	Group 1	Group 2	p value
Age < 24hours	127 (63.50%)	116 (58.00%)	0.26
>24hours	73 (36.50%)	79 (39.50%)	
Weight(mean+_SD)Kg	2.88+_0.32	2.84+_0.31	0.307
Sex males	106(53%)	121(60.50%)	0.158
females	94(47%)	79(39.50%)	
Gestational age	38.72+_0.86	38.71+_0.92	0.93

Table: 2- Mean NIP scores in 2 groups after BCG vaccination

	NIPS 0 Mean+_SD	NIPS 30 sec Mean+_SD	NIPS 60 sec mean+_SD	Combined NIPS Mean +_S.D
BCG group 1	2.35+_1.18	0.92+_0.81	0.1+_3	3.38+_2.01
BCG group 2	2.65+_1.36	1.26+_1.04	0.32+_0.62	4.24+_2.75
P Value	0.025	0.001	<0.0001	0.004

Table: 3- Mean NIPS scores in 2 groups after Hepatitis B vaccination

	NIPS 0 sec Mean+_SD	NIPS 30 Mean+_SD	NIPS 60 Mean+_SD	Combined score Mean+_SD
Group 1Hepatitis b	4.74+_1.21	2.08+_0.85	0.34+_0.57	7.16+_2.23
Group2 Hepatitis b	5.4+_1.33	3.36+_1.12	1.54+_0.88	10.3+_3.04
P Value	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Table: 4-Combined score of BCG and Hepatitis B in both the groups:

	Mean+-SD	Median	P Value
Group 1	10.54+_3.92	10	< 0.0001
Group 2	14.54+_4.97	15	

Discussion

All the infants are given BCG vaccine and Hepatitis B vaccine under immunisation program at birth. Of the two vaccines, BCG is given by intradermal route and hepatitis B is given by intramuscular route. Pain during intramuscular route is significantly higher than the pain due to in the intradermal route⁽¹²⁾. This can be explained by the fact that needle used for intramuscular injection is of wider bore as compared to that used for intradermal route. The overall pain was more when a more painful intramuscular was given first followed by intradermal route as compared to when intradermal vaccine was given first followed by intramuscular route. The difference to the pain perceived by the neonates in two groups may be due to the fact that the route of administration of the two vaccines was different and were given in different order. Pain intensity assessed by NIPS scores was quite significantly less at all the

intervals of time after vaccination injections when intradermal BCG vaccine was given first as compared to when intramuscular Hepatitis B vaccine was given first. Same was the case when combined NIPS score were analysed for two groups. The present data suggests that the least painful vaccine should be administered first when 2 vaccines having different routes of administration are given at a time to reduce overall pain of procedure. Giving the more painful injection first probably focuses the infant's attention on the procedure and activates central and peripheral mechanisms of pain processing. Thus, the pain signal during subsequent injections administered immediately thereafter could be amplified. The present findings are in agreement with a study by S R Ravi Kiran et al on Pain Response in Newborns to the Order of Injecting BCG and Hepatitis-B Vaccines although the number of newborns studied was very small i.e.

76 only as compared to our study where we studied 400 newborns [2]. This study involved comparison of neonatal pain responses when the order of injection of 2 vaccines was changed.

Limitation

The two vaccines in question have different routes and sites of administration making it impossible to achieve blinding for the person performing the scoring. However, the investigators were not involved in vaccine administration or pain scoring. The scoring doctors and nurses who administered injections were blinded to the purpose and hypothesis of the study. Pain assessment is best assessed by self-report measures which is not possible in newborns as they require certain levels of verbalisation and neurodevelopment. So accurate assessment of pain in newborns is difficult as behavioural responses are used for assessment of pain.

Conclusion

While administering two injections in newborns at the same time having different routes intradermal injection should be given first followed by intramuscular injection. This simple manipulation can greatly reduce the intensity of pain perceived. Same can be implied to BCG and Hepatitis-B vaccines given to every newborn soon after birth under immunisation program. So we recommend that when BCG and Hepatitis-B vaccines are given in same vaccination session, the BCG should be injected before the Hepatitis-B vaccine to reduce the overall pain perceived.

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