

# Analogy and collation of Valsalva manoeuvre and Ball compression on pain during arteriovenous fistula cannulation in patient with chronic renal failure on haemodialysis

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## Abstract

**Introduction:** Valsalva manoeuvre and Ball compression will be effective in reducing pain during arteriovenous fistula cannulation in patient with chronic renal failure on haemodialysis.

**Objective:** To assess the pre-test level of pain during arteriovenous fistula cannulation among haemodialysis patients, to assess the post-test level of pain during arteriovenous fistula cannulation after practicing Valsalva maneuver among haemodialysis patients, to assess the post-test level of pain during arteriovenous fistula cannulation after practicing ball compression among haemodialysis patients and to compare the pre-test and post-test level of pain after practicing Valsalva maneuver during arteriovenous fistula cannulation among haemodialysis patients. To compare between pre-test and post-test analysis of Valsalva manoeuvre and Ball compression in reducing pain during arteriovenous fistula cannulation in patient with chronic renal failure on haemodialysis.

**Materials and Methods:** About 50 patients were selected and their pain during cannulation was assessed on a verbal pain scale of 0-10. Two sessions of dialysis were selected and the average calculated. Afterwards the same set of patients were asked to do the Valsalva manoeuvre during cannulation and pain severity recorded for next two sessions and the average calculated. Then the patients were explained about the ball compression method and they were cannulated along with ball compression for next two sessions and the average calculated.

**Statistics:** ANNOVA followed by Dunnett's Multiple Comparison test. p value <0.05 was considered as statistically significant.

**Results:** We found that both Valsalva manoeuvre and Ball compression on pain during arteriovenous with fistula cannulation in patient with chronic renal failure on haemodialysis with a p value of < 0.01 which was highly significant.

**Conclusion:** Both Valsalva manoeuvre and Ball compression was equally effective in reducing pain during arteriovenous fistula cannulation in patient with chronic renal failure on haemodialysis.

**Keywords:** Arteriovenous fistula cannulation, Ball compression, Chronic renal failure, Haemodialysis, Valsalva manoeuvre.

## Introduction

Damage to kidneys or decrease in glomerular filtration rate with <60 ml/min for three months or more is the definition of chronic renal failure.<sup>1</sup> Worldwide, more number of patients are suffering from end stage renal disease and among the number of patients, about 20-30 patients will have renal dysfunction of some degree who needs renal transplant.<sup>2</sup> Dialysis is a process to remove excess of waste and water.<sup>3</sup> Even though, dialysis has not completely replaced kidney function, but may manage kidney function activities as result of diffusion and ultrafiltration.<sup>4</sup> The criteria for dialysis are extracellular volume expansion, uremic syndrome, hyperkalaemia, failure to medical treatment, creatinine clearance of 10 ml/min/1.73 m<sup>2</sup> or less etc.<sup>5-7</sup> An unpleasant feeling along with emotional experience that is associated with actual or potential tissue damage including physiological and psychological response for which a patient visits the health-care centres is due to pain.<sup>8</sup>

A non-pharmacological treatment to reduce pain is Valsalva maneuver which act by increasing the intrathoracic pressure that activate baroreceptors followed by vagal stimulation that reduces the pain.<sup>9</sup> Valsalva maneuver is so unique method as it does not require any equipment. It can be easily learned by the patients that reduces the pain intensity related to peripheral venous cannulation and also

has helps to increase the success rate of venous cannulation.<sup>10</sup> Valsalva maneuver also decreases the pain due to skin puncture in spinal injection.<sup>11</sup>

To reduce painful needle insertion, many techniques like infiltration analgesia and eutectic mixture of local anaesthetics (EMLA) patch have been used, but local anaesthetics produce pain during the procedure and there exists doubt regarding infiltration analgesia advantages over puncture without analgesia.<sup>12-14</sup>

Both somatic and psychological components are involved in pain and more over local anaesthetics reduces somatic pain and attention-diverting measures (pressing ball) diverts the pain of psychological component.<sup>15-17</sup>

Based on the above fact the following study was undertaken to access analogy and collation of Valsalva manoeuvre and Ball compression on pain during arteriovenous fistula cannulation in patient with chronic renal failure on haemodialysis.

The objectives of this study was to do analogy and collation of Valsalva manoeuvre and Ball compression on pain during arteriovenous fistula cannulation in patient with chronic renal failure on haemodialysis.

## Materials and Methods

Institution Ethics consent was obtained and informed consent was taken from study participants. Study was

conducted in the Department of Nephrology, Pushpagiri Medical College. Time period was from 01-01-18 to 31-01-18.

### Study Design

About 50 patients were selected and their pain during cannulation was assessed on a verbal pain scale of 0-10. Two sessions of dialysis were selected and the average calculated. Afterwards the same set of patients were asked to do the Valsalva manoeuvre during cannulation and pain severity recorded for next two sessions and the average calculated. Then the patients were explained about the ball compression method and they were cannulated along with ball compression for next two sessions and the average calculated.

### Inclusion Criteria

1. Patients undergoing haemodialysis and with a patent AV fistula. A mature AV fistula which is in use for at least a month

### Exclusion Criteria

1. Patients with diabetic neuropathy or other neurological disorders altering the pain perception
2. Patients with aneurysmal dilation of fistula
3. Patients with cellulitis of the fistula arm.

### Statistics

ANNOVA followed by Dunnett's Multiple Comparison test. p value <0.05 was considered as statistically significant

### Results

**Table 1: Comparison of Valsalva manoeuvre and Ball compression in chronic renal failure on haemodialysis**

Pre-test	Post Valsalva manoeuvre	Post Ball compression	Q value	p value
7.64±0.12*	4.32±0.17**	5.06±0.12**	>2.235	< 0.01
ANNOVA followed by Dunnett's Multiple comparison test. *p = >0.05, ** <0.05				

### Discussion

As per American pain society is considered as important part of care and a "fifth vital sign" to be emphasized for effective pain management. Dialysis is a painful procedure and the patient will be already on the psychological stress of their condition and physical pain adds on to it making the life miserable, hence non pharmacological pain management is the best method of pain management and hence this study was selected.

Activation of the sinoaortic baroreceptor reflex arc is the main factor that is involved in Valsalva maneuver.<sup>18</sup>

Valsalva maneuver is known to reduce pain by a variety of complex mechanism as is proved by the data of related to haemodynamics linked to modulators of pain perception by a baroreceptor reflex the triggers an antinociception. Valsalva maneuver is known to act by dual mechanism that is by distraction component and sinoaortic baroreceptor reflex arc mediated antinociceptive mechanism which was maintaining circulatory homeostasis utilizing peripheral receptors and central nervous system through reflex adjustment of parasympathetic and sympathetic efferent to the cardiovascular system. Release of Substance-P into circulation, secretion of noradrenaline which increase blood pressure and distribution of blood flow towards heart are the three main mechanisms by which sinoaortic baroreceptor reflex works.<sup>19-21</sup>

During Valsalva maneuver contraction of thoracic cage compresses lungs and cause increase in intrathoracic pressure resulting in compression of vessels within the chest and in turn baroreceptor activation. The activation of the cardiopulmonary baroreceptor reflex induces antinociception.

Cardiopulmonary (CP) baroreceptors have thought to modulate baroreflex control of sympathetic nerve activity. Due to loading of CP baroreceptors due to increase intrathoracic pressure causes modulation of baroreflex

control sympathetic nerve activity and it causes antinociception.<sup>22</sup>

The efficacy of Valsalva maneuver on needle projection pain has been reported in various studies.<sup>23-25</sup>

The Valsalva maneuver or Valsalva manoeuvre is performed by moderately forceful attempted exhalation against a closed airway, usually done by closing one's mouth, pinching one's nose shut while pressing out as if blowing up a balloon. Ball compression is done by guiding the patient to compress a rubber ball during the procedure and the values were recorded on a pain scale and graded between 0 to 10 by both pre-test and post Valsalva manoeuvre and Post Ball compression.

We found that both Valsalva manoeuvre and Ball compression was equally effective in reducing pain during arteriovenous fistula cannulation in patient with chronic renal failure on haemodialysis with a p value of < 0.01 (Table 1).

### Conclusion

Patient undergoing dialysis will be already on many medications and analgesic to reduce pain during the procedure of dialysis will be an extra burden both clinically and economically, hence non-pharmacological treatment like Valsalva manoeuvre and Post Ball compression can offer alternative approach in pain reduction.

**Conflict of Interest:** None.

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