

**[CASE ARTICLE]****The clicking sound after mechanical heart valve replacement: Can it hinder the level of physical activity in patient? - A case report.****Ms. Trusha Raje (PT)<sup>1</sup>, Dr Chhaya Verma(PT)<sup>2</sup>, Dr Hetal Mistry(PT)<sup>3</sup>**<sup>1</sup>PG Student, <sup>2</sup>Professor & Head, <sup>3</sup>Assistant Professor

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**ABSTRACT :**

The audible closure of the replaced mechanical heart valve, called 'clicking sound' has impact on the sleep and quality of life. We present a case of a 25-year-old male who reported five months after his mitral valve replacement, with restriction in physical activity, social and occupational participation due to disturbance caused by the constant clicking sound of the valve. Cardiac rehabilitation was implemented for four weeks. All the exercises were performed with the patient perceiving and understanding the safety of the clicking of valve to alleviate his fear. Correct patient education regarding clicking of replaced valve not only regained confidence, physical activity levels but also helped him to restart his job within four weeks of physiotherapy rehabilitation. Hence the impact of this study is that, the continuous valve noise though healthy can be a hinderance to physical activity levels and should not be underestimated.

**Key Words:** Mechanical heart valve replacement, clicking valve sound, physical activity, cardiac rehabilitation.

**Introduction:**

Valve replacement surgery involves replacement of one or more of the heart valves with either a mechanical or a bioprosthetic heart valve.<sup>(1)</sup> The choice of the valve is decided based on age, cardiac condition of the patient, systemic illnesses, socio-economic status, gender and monitoring of anti-coagulation. Mechanical valves are usually chosen based on their easy availability and durability.<sup>(2)</sup> Mechanical heart valves generate a clicking sound that is often audible not only to the patient but also their relatives.<sup>(3,4)</sup> The audible clicking sound of the mechanical valve is considered a source of disturbance. It can result in annoyance, sleeping disorders, concentration disturbance and social embarrassment. Unlike life threatening conditions like anti-coagulation and thromboembolic events, quality of life and physical activity interference due to constant ticking noise usually gets underestimated.<sup>(5)</sup> The surgical replacement of diseased heart valves is based on the ground that the prosthesis chosen to replace a diseased heart valve will improve or prevent further deterioration of

heart function, improve functional status, and thus promote quality of life.<sup>6</sup> A case report by Kerendi F, Guyton RA reported that due to severe difficulty experienced by a 55 years old patient because of mechanical valve clicking, he requested for a redo valve replacement with a bio prosthesis valve, 4 months after the first mechanical valve surgery. Thus, the authors concluded that the potential risk of valve noise on patient's quality of life should be taken into consideration.<sup>(7)</sup>

This case report highlights the negative effect of valve noise on functional capacity and effectiveness of physiotherapy interventions in improving the valve noise related physical activity and sleep quality in mechanical mitral valve replacement patient.

**Case Presentation:**

A 25 years old male, mechanic by occupation was operated for Mitral Valve replacement with SJM 31mm Master series Mechanical Heart Valve. He came to Physiotherapy Out-patient Department 5 months after his surgery, with chief complaints of difficulty in climbing flight of stairs and decreased

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occupational and social participation. He also reported to have decreased sleep after surgery. On interviewing the patient, he reported the difficulty in performing activities and participation due to the disturbance caused by the increased frequency in the clicking of the valve. He described that the valve noise sounds like a 'ticking bomb' on doing any physically exerting activity.

He was assessed for his functional capacity, sleep quality, quality of life and fear of activity (Kinesiophobia) score on his day 1 of rehabilitation and documented. Physiotherapy intervention included patient education regarding the safety of valve clicking, breathing exercises, strengthening and endurance exercises of upper limb and lower limb and aerobic exercise and functional training.

Patient education focused on making the patient understand the structure, working and mechanism of the valve and the safety of its increased clicking on doing any physical activity.

Table 1 gives the graded program at 1st, 2nd and 4th week. Patient was encouraged to do the exercises with self-monitoring of symptoms.

One Minute Sit to Stand test, Two-minute step test, Six Minute Walk Test, Pittsburgh sleep quality index, SF-36 and TSK-SV Heart were the outcome measures used. They were assessed at baseline and thereafter once every week. The results at week 1, 2 and 4 are outlined in Table 2.

**Table 1:** Physiotherapy Management in out-patient department

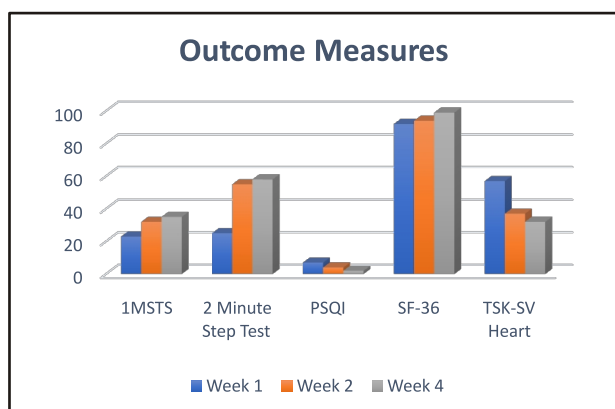
WEEK 1		
TREATMENT	DESCRIPTION	DOSAGE
1. Patient Education	Patient education consisted of- <ul style="list-style-type: none"> <li>• Encouragement to speak about concerns and complaints.</li> <li>• Explaining the description, working, and structure of the replaced valve by a pictorial diagram of the valve.</li> <li>• Explaining the mechanism of the valve leaflets and the clicking sound.</li> <li>• Explaining the effect of exercise on the frequency of the valve clicking.</li> </ul>	Once a week or as per required.
2. Aerobic Exercises	<ul style="list-style-type: none"> <li>• Mobility exercise of bilateral upper limb and lower limb</li> <li>• Sit to stand exercise</li> <li>• Upper limb endurance exercise with arm ergometer</li> <li>• Stepping (6inch stepper)</li> <li>• Cycling</li> </ul>	<ul style="list-style-type: none"> <li>• 30-45 minutes</li> <li>2 times per day</li> <li>3 times per week</li> </ul>
3. Resistance Exercises	<ul style="list-style-type: none"> <li>• Wall Squats</li> <li>• Upper limb strengthening with ½ kg dumbbells</li> </ul>	<ul style="list-style-type: none"> <li>• 1 set= 15 repetitions</li> <li>3 sets per session</li> <li>2 times per week</li> </ul>
WEEK 2		
1. Breathing Exercises	<ul style="list-style-type: none"> <li>• Diaphragmatic Breathing Exercise</li> <li>• Thoracic Expansion Exercise</li> </ul>	<ul style="list-style-type: none"> <li>• 1 set= 10 repetitions</li> <li>2 sets per session</li> <li>3 times per week</li> </ul>
2. Aerobic Exercises	<ul style="list-style-type: none"> <li>• Cycling</li> <li>• Upper limb endurance</li> <li>• Stepping</li> </ul>	<ul style="list-style-type: none"> <li>• 30-45 minutes</li> <li>2 times per day</li> <li>3 times per week</li> </ul>
3. Resistance Exercises	<ul style="list-style-type: none"> <li>• Stepping with 1 kg weight cuff</li> <li>• UL strengthening with 1 kg weight</li> <li>• Forward lunges progress to 2 kg</li> <li>• Squats with 2 kg weight</li> </ul>	<ul style="list-style-type: none"> <li>• 1 set = 15 repetitions</li> <li>3 sets per session</li> <li>2 times per week</li> </ul>

WEEK 3-4		
1. Breathing Exercises	<ul style="list-style-type: none"> <li>Resisted breathing exercises with TheraBand</li> </ul>	<ul style="list-style-type: none"> <li>1 set = 10 repetitions</li> <li>2 sets per session</li> <li>3 times per week</li> </ul>
2. Aerobic Exercises	<ul style="list-style-type: none"> <li>Stair Climbing</li> <li>Cycling with increased pedal resistance</li> <li>Treadmill walking with increased speed and inclination</li> </ul>	<ul style="list-style-type: none"> <li>30-45 minutes</li> <li>2 times per day</li> <li>3 times per week</li> </ul>
3. Resistance Exercises	<ul style="list-style-type: none"> <li>Upper limb strengthening with body weight resistance- push ups</li> <li>Stepping with 2 kg weight</li> </ul>	<ul style="list-style-type: none"> <li>1 set = 15 repetitions</li> <li>3 sets per session</li> <li>2 times per week</li> </ul>

**Table 2:** Patient related outcome measures before and after rehabilitation

TEST	Week 1	Week 2	Week 4
• 1 MSTS	23	32	35
• 2 Minute step test	25	55	58
• 6 MWD (meters)	360	420	540
• PSQI	7	4	2
• SF-36	92	94	99
• TSK-SV Heart	57	37	32

1 MSTS: One Minute Sit to Stand, 6MWD: 6 Minute Walk Distance, PSQI: Pittsburgh Sleep Quality Index, SF-36: Short Form Survey-36, TSK-SV Heart: Tampa Scale of Kinesiophobia for Heart



**Fig. 1:** Outcome Measures

1 MSTS: One Minute Sit to Stand, PSQI: Pittsburgh Sleep Quality Index, SF-36: Short Form Survey-36, TSK-SV Heart: Tampa Scale of Kinesiophobia for Heart

The One- minute sit to stand, Two-minute step test and 6MWD improved by 71%, 55% and 60% respectively. The quality of life (SF-36) and sleep

quality (PSQI) improved by 92% and 40% respectively. The level of fear of activity (TSK-SV Heart) reduced by 58%.

Patient was the sole earning member of a family of 6. He felt that his health was worse than before surgery and thus felt unaccomplished, down-hearted and blue. Moreover, he felt debilitated when he compared himself to others of his age and of them being able to do certain activities. He loved dancing but stopped because of the disturbance of valve sound. He showed compliance towards cardiac rehabilitation and thus was able to resume duties within 4 weeks with decreased disturbance by valve and improved functional capacity, sleep quality and quality of life.

### Discussion:

Many studies have dealt with the physical characteristics of the mechanical valves, some have discussed about the psychological aspects of the valve sounds. More recently, the impact of the valve sounds on quality of life have also been addressed.

Mechanical valve replacements have proven to be reasonably safe and effective procedure. They are durable but thrombogenic and thus require life-long anticoagulation. Though chosen for its long-term durability, the impact it has on the quality of life cannot be ignored. The affected quality of life can be due to clicking noise, patient's mental state, knowledge of anti-coagulation and other mechanical valve related complications.

The continuous valve noise and the extent it affects the quality of life of the patients may get underestimated by cardiac surgeons as compared to life-threatening conditions like thromboembolism or warfarin toxicity.

A still poorly known issue of the mechanical valve is

the impact the clicking sound has on the physical activity levels of the patient. Any physical activity elicits a chronotropic response like increase in vital parameters in accordance with the intensity of activity. This leads to increase in the frequency of opening and closing of the valve that now has mechanical leaflets thus creating increased audible noise. In this case report, the patient classically reported the noise on doing any physical activity similar to a 'ticking bomb'. Such an occurrence raises safety issue among patients regarding the integrity of the replaced valve. In an attempt to prevent it from occurring again, the patient avoids any activity that can lead to increased clicking thus leading to reduced physical activity and further deconditioning and decreased exercise tolerance.

This case report highlights how patient education regarding the clicking sound and a structured cardiac rehabilitation program can help the patient overcome the fear of the valve noise and improve physical activity levels. In this case report, the patient presented with decreased aerobic capacity and strength due to lack of physical activity caused by the increased clicking of the replaced mechanical valve. As a result, the patient was unable to participate in his occupational and recreational environment.

Physical assessment and examination were taken on the first session. The functional capacity was assessed using the One Minute Sit to stand test, Two Minute step test and Six Minute walk Test. The Quality of life and Sleep parameter assessed using the SF-36 and Pittsburgh Sleep Quality Index (PSQI) respectively. The level of fear of activity was assessed with Tampa Scale for Kinesiophobia Heart (TSK-SV Heart).

Cardiac Rehabilitation was started with Patient Education about the functioning of the valve and the safety of clicking. Exercises included breathing exercises, mobility exercises of upper and lower limb, lower limb strengthening exercises initially at moderate intensity and then gradually progressing to vigorous level.

In this case, the physiotherapy management was implemented according to the exercise prescription for individuals with cardiovascular disease participating in out-patient cardiac rehabilitation in patients with median sternotomy given by ACSM guidelines.<sup>(8)</sup> The target heart rate was calculated using the Karvonen's formula.

All the exercise were performed with the patient perceiving and understanding the safety of the clicking of the valve to alleviate the fear and thus improve his functional capacity and quality of life. The One- minute sit to stand, Two-minute step test and 6MWD improved by 71%, 55% and 60% respectively. The quality of life (SF-36) and sleep quality (PSQI) improved by 92% and 40% respectively. The level of fear of activity reduced by 58% (Table 2 and Figure 1). Thus, the structured implementation of cardiac rehabilitation with special emphasis on patient education about the valve clicking made the patient fully functional with improved sleep quality and confident enough to resume his occupational as well as recreational duties.

This case report highlights the fact that how a normal and healthy phenomenon like the clicking noise of the replaced mechanical valve could lead to disturbance and hindrance in physical activity levels. Clicking of the valve is a healthy phenomenon. Still despite of the fact, here in this case it became an obstacle to patient's functioning and led to significant participation restriction.

Thus, patient education plays a very important role in our rehabilitation.

A study by Laurens et al reported that younger patients with mitral valve replacement complained more than older patients with aortic valve replacement about the valve sounds.<sup>(9)</sup> A majority of mechanical valve replacements are usually done in the younger age group of people thus, complains about the valve sounds may lead to decreased physical activity among young population.

A limitation to rehabilitation was delayed physiotherapy intervention after surgery. D Limb had reported that only a few patients had received information about the potential clicking noise.<sup>10</sup> Thus, when the problem aroused, they were poorly prepared. Thus, pre-operative patient education plays a very crucial role to prevent such occurrence after surgery. The pre-operative education could be in the form of auditory recording of the clicking noise of the valve at rest and after activity or communicating with a patient already operated with the similar surgery.

### Conclusions:

The impact of the continuous clicking sound of the replaced mechanical valve on physical activity levels



should not be underestimated. Through this case report, we focus on the importance of patient education and cardiac rehabilitation in alleviating the fear of physical activity due to the clicking noise of the replaced valve. Educating the patient in a correct way of importance of clicking heart sound and improving his fear of activity by proper intervention of cardiac rehabilitation helps to achieve right goal of the patient and improves his quality of life.

#### **Patient's Perspective:**

For almost 5 months after my surgery, I felt that my health was worse than it was before surgery. The increase in the 'click-click-click' sound of my heart whenever I tried to do any physical activity scared me and thus, I avoided it. When I felt totally weak, I started physiotherapy and for the first time after surgery with treatment and advice given by my physiotherapist, I am not facing any problems. I feel confident and have resumed back to my job happily.

#### **List of Abbreviations:**

**SJM**- St Jude Medical

**SF-36**-Item Short Form Health Survey

**TSK-SV** - Tampa Scale of Kinesiophobia Heart-Short Version

**6MWD** -Six Minute Walk Distance

**PSQI** -Pittsburgh Sleep Quality Index

**ACSM** -American College of Sports Medicine

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