Cardiogenic dementia improved after permanent pacemaker implantation: a case report

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ABSTRACT

Background: Heart diseases are the most common diseases worldwide which cause significant morbidity and mortality. Bradycardia comes under the category of heart diseases and is more common in the elderly. Bradycardia is defined as "heart rate of less than 60 beats per minute (bpm)". There is a wide range of causes of bradycardia and the road to diagnosis includes extensive investigations.

Case Presentation: Here we present the case of a 71-year-old male who presented with a history of dizzy spells, easy fatigueability, syncopal attacks, and memory impairment for 3 months prior to admission. On investigation, his complete blood counts, liver function tests, renal function tests, serum electrolytes, and urine routine examination were normal. His thyroid function tests were also normal. Electrocardiogram showed sinus bradycardia with pauses. Echocardiography was also normal. Holter monitoring showed multiple sinus pauses of 3.15 seconds average.

Conclusion: We made a diagnosis of cardiogenic dementia due to sinus node dysfunction. The patient underwent permanent pacemaker implantation therapy and his symptoms improved. Our case highlights the importance of early diagnosis of the culprit disease and early intervention to prevent further complications.

Keywords: Dementia, bradycardia, pacemaker.

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Background

Heart diseases are the leading cause of death and disability all over the world, especially in the elderly population [1]. Sinus node dysfunction is a common finding in this age group [2]. Sinus bradycardia is more significant in elderly people because it can signify conduction abnormality or any serious cardiac disease which can potentially be treatable and can be life-saving if carried out at a specific time period [3]. Patients usually present with symptoms like dizziness, easy fatigue-ability, and memory impairment [1]. Patients with bradyarrhythmias or sinus node dysfunction without any reversible cause are candidates for permanent pacemaker implantation which can readily improve their symptoms [4].

We present one such case in which permanent pacemaker implantation had significantly improved the patient's symptoms, especially memory improvement.

Case Presentation

A 71-year-old educated male with no previously established pre-morbids presented at the outpatient Department of Cardiology in our hospital with complaints of dizzy spells, easy fatigue-ability, shortness of breath, and memory impairment for the last 3 months. These symptoms

were progressive in nature and were affecting the patient's life, to the extent that he was functional class I and now he deteriorated to functional class III in just 3 months time. Patient's attendants gave the history that his memory impairment had worsened to the extent that he cannot recognize his family members and simple directions of his own home and does not remember his own name and name of the months. There was no history of fever or intake of any drugs or medicines. On examining the patient, he had severe memory impairment and he did not remember his name. He could not recognize his family members and place of his presence. He was vitally stable: blood pressure was 125/84 mmHg, pulse rate was 50 bpm, afebrile, oxygen saturation was 98% at room temperature, respiratory rate was 16/minute, JVP was not raised, no lymphadenopathy, and no signs of dehydration or pedal edema. On cardiovascular examination, his pulse was regular, normal volume, but with small occasional pauses. Both heart sounds were audible with no additional heart sound. Chest was bilaterally clear with normal vesicular breathing. Central nervous system examination showed no neurological deficit or signs of Parkinsonism, but mini mental state examination showed severe dementia, with a score of 9/30. On investigation, his complete blood count,

liver function tests, renal function tests, serum electrolytes, urine routine examination, and chest x-ray were normal. Electrocardiogram (ECG) showed sinus bradycardia with sinus pauses (Figure 1).

His CT-scan of the brain was also done to rule out any central cause of his symptoms, but that was also normal. His thyroid function tests were also normal. Echocardiography was also normal with 60% ejection fraction. Considering sinus bradycardia and sinus pauses, a 24-hour Holter monitoring was done, which showed multiple sinus pauses with an average of 3.15 seconds (Figure 2).

So, keeping in view the typical presentation and investigations, our final diagnosis was sinus node dysfunction causing sinus pauses and leading to cardiogenic dementia. Depending upon our diagnosis, we managed our patient with the implantation of a permanent pacemaker device (Figure 3). The whole procedure was done safely with good final results and with no complications. The patient's heart rate was set at 60 bpm and was permanent pacemaker-dependent. The patient was stable and discharged after 1 day post-procedure. After 2 weeks, the patient came for follow-up and he was reassessed and was well oriented with time, place, and person, and his family members told that his memory functioning has improved rapidly and he started doing his all chores by himself again. He was maintaining his vitals with a pulse rate of 60 bpm. His mini mental state examination had improved from 9/30 to



Figure 1. ECG showing sinus bradycardia with sinus pauses.



Figure 2. 24-hour Holter monitoring showing sinus pauses with an average of 3.15 seconds.

23/30. The patient was advised for follow-up interrogation of pacemaker.

Discussion

Our patient was finally diagnosed as case of sinus node dysfunction, revealing itself as sinus pauses and complicated as progressive memory impairment. He was an old man in his early seventies with no established pre-morbids and presented with dizzy spells and memory impairment. His Holter monitoring showed sinus pauses of 3.15 seconds. To the best of our knowledge, most of the cases published, to date, showed that patients usually present with dizzy



Figure 3. Chest x-ray showing permanent pacemaker dual chamber-rate modulated pacing (DDD-R).

Table 1.	Mini mental	state	examination	of the	patient.
		0.0.0	0/10/11/10/10/11	0	panonn

ONE POIN	T FOR EAC	HANSWER				BEFORE PPM	AFTER PPM
Orientatior	1						
Year	Season	Month	Date	Tin	ne	2/5	5/5
Country	Town	District	Hospit	al	Ward/Floor	2/5	5/5
	names three				ny) and ask the patient to repeat (1 point repeating until correct)	2/3	3/3
Subtract 7					five times: 100, 93, 86, 79, and 65.	0/5	3/5
Recall Ask for the	names of th	nree objects le	arned earl	ier.		0/3	1/3
Repeat "no Give a thre then put it Ask the pa instruction	, ifs, ands, c e-stage com on the table) tient to read is "close you	nmand: score) and obey a w ur eyes."	1 for each	nand	(e.g., hold the paper, fold it twice, and on a piece of paper. The written	1/2 0/1 1/3 1/1	2/2 0/1 2/3 1/1
Copying		a sentence. S			nsible and has a subject and a verb.	0/1	0/1
		7					
Total						09/30	23/30

Ppm = permanent pacemaker.

spells and shortness of breath. Our patient had a distinct clinical presentation of memory impairment which improved rapidly after pacemaker implantation.

Heart diseases are the leading cause of significant morbidity and mortality worldwide, especially in the elderly [1]. Sinus node dysfunction and bradycardia are included in these diseases and are prevalent in the elderly population [2]. Increasing age is related to progressive idiopathic fibrosis of sinoatrial node and atrioventricular conduction system, which lead to sinus node dysfunction and bradycardia [5]. Common symptoms of sinus node dysfunction include dizziness, shortness of breath, easy fatigue-ability, and rarely memory impairment [1]. Bradycardia results in symptomatic cerebral hypoperfusion, especially in the elderly people [6]. The regulation of cerebral blood flow is significantly related with heart rate. Studies have shown that severe bradycardia results in the decline of cognitive functioning, especially in older people [7]. Vascular dementia can be described as the decline in thinking skills caused by cardiac conditions that block or reduce cerebral blood flow. Cardiovascular risk factors which cause cerebral hypoperfusion lead to disturbed hemodynamic flow, which ultimately results in ischemic disruption of microstructural integrity of neurons causing vascular dementia [8]. Studies have shown that cerebral autoregulation does not necessarily protect the brain from chronic brain hypoperfusion that is caused by low cardiac output or hypotension. It is especially worrisome in older people because the mechanism of cerebral autoregulation may become impaired with old age [1].

If there is no reversible cause found on investigating the patient for bradycardia, as was the case in our patient, permanent pacemaker implantation is the ultimate answer for patients with symptomatic bradycardia [5]. Indications for permanent pacemaker implantation come under the umbrella of four classes: (1) mandatory, (11a) raisonable, (llb) possible, and (lll) contraindicated [2]. In our case, there was class 1 indication: sinus node dysfunction with documented symptomatic bradycardia, including frequent sinus pauses that produce symptoms. Implantation of permanent pacemaker is highly cost-effective, safe, and simple to carry out. It can be implanted in all age groups, but it is especially prevalent in older people because of the increase in cardiac conduction abnormalities in this age group [9]. Koide et al. [7] described in their study that cognitive impairment can be reversed by cardiac pacing. It is attributed to the fact that maintaining adequate heart rate can improve cerebral perfusion and hence cognitive functioning [1,6].

Because of the fragility of conditions in elderly people, basic knowledge of bradyarrhythmias and decision of pacemaker implantation are crucial elements for the treating physician [10].

Conclusion

Bradycardia is a common manifestation of cardiovascular diseases with different presentations. These cases should be thoroughly investigated for the cause and should be treated early and accordingly to prevent any further life-threatening complications.

Our patient was having sinus bradycardia complicated by sinus pauses and memory impairment: cardiogenic dementia was successfully treated with permanent pacemaker implantation.

What is new?

Patients with sinus bradycardia usually present with dizzy spells and shortness of breath. Our patient had a distinct clinical presentation of memory impairment which improved rapidly after pacemaker implantation.

List of Abbreviations

JVP jugular venous pressure CT-scan computed tomography scan

Consent for publication

Written consent was obtained from the patient.

Ethical approval

Ethical approval is not required at our institution to publish an anonymous case report.

Author details

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Summary of the case

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1	Patient (gender, age)	Male, 71-year old	
2	Final diagnosis	Cardiogenic dementia improved after permanent pacemaker implantation	
3	Symptoms	Memory impairment	
4	Medications	Permanent pacemaker implantation	
5	Clinical procedure	al procedure Pacemaker implantation	
6	Specialty	Cardiology	