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Can the Left Internal Mammary Artery Be Used During Coronary Artery Bypass Graft Surgery in Patients Undergoing Bone Marrow Transplant? A First Case Report

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Abstract

Introduction: With the improvements in neoplasm treatments and the increased survival of patients with neoplastic diseases, we have entered a new era of having to deal with the complications of senile patients. The issue of bone fusion or the side effects of its delay, such as malunion or infections, are among the concerns for any surgery in patients whose bone marrow is affected by treatment or whose bone marrow blood flow is impaired. The left internal mammary artery (LIMA) is used for coronary artery bypass graft (CABG) surgery with its 2 - 3 times longer lifespan compared to saphenous vein grafts, but its harvest from the sternum affects the sternum blood flow and the outcome of its use is still not identified in patients undergoing bone marrow transplant. This case report is the first report on this issue.

Case Presentation: A 60-year-old man with diffuse large B cell lymphoma who had undergone bone marrow transplant a year before had then developed chest pain, which was diagnosed as vessel disease; he was selected for CABG surgery. The LIMA was harvested during the surgery and the left anterior descending artery (LAD) was anastomosed. The saphenous vein graft was also anastomosed to the diagonal artery, obtuse marginatus (OM), posterior descending artery (PDA), and posterior left ventricle (PLV). After the surgery, the patient was followed up for six months, during which time no specific incidents occurred and no sternum-related complications were observed either.

Conclusions: In this case report, the use of LIMA in a patient who had undergone a bone marrow transplant and CABG surgery was not associated with any increase in sternum-related complications.

Keywords: Bone Marrow Transplant, Coronary Artery Bypass Graft, Left Internal Mammary Graft

1. Introduction

With the increased survival of patients following bone marrow transplant (BMT), new unprecedented issues arise that need to be addressed. Coronary artery occlusion is one of these problems (1, 2). Atherosclerosis exacerbates in patients after BMT (2) and these patients are anticipated to need coronary artery bypass graft (CABG) in the near future (3).

The challenging issue is that the best vascular patency, survival, and quality of life are observed in patients whose left internal mammary artery (LIMA) has been used for CABG (4, 5).

Harvesting the LIMA can, on the one hand, increase the risk of infection, malunion, or surgery complications, and on the other hand, if we do not use the LIMA, the lifespan of grants and their patency is usually up to about five years, after this time the patient will need another intervention. However, this time is about ten years or more with the use of the LIMA (4, 5).

The LIMA is used for CABG surgery with its 2 - 3 times longer lifespan compared to saphenous vein grafts, but its harvest from the sternum affects the sternum blood flow and the outcome of its use is still not identified in patients undergoing bone marrow transplant. This case report is the first report on this issue.

The question is whether we can use the LIMA in these people even though their bone marrow is involved and they have undergone BMT before.

A review of the literature showed no reports on any similar cases, and the present is the first case report on the use of the LIMA in cardiac surgery following BMT and the assessment of sternum-related complications over a six-month follow-up.

We hope that future efforts at collecting data on this subject can help provide a protocol for the treatment of these patients.

2. Case Presentation

A 60-year-old man with diffuse large B cell lymphoma who had undergone a bone marrow transplant a year before had then developed chest pain. Before the visit, no coronary artery examination had been performed on the patient and no information was available on the patient's coronary artery status.

Examinations following chest pain included angiography, which indicated three-vessel disease (3VD), and the patient was therefore selected for CABG and was transferred to the operating room after some routine examinations.

Having found no reports or articles on the use of the LIMA in BMT patients, we decided to use the LIMA and saphenous vein for CABG in this patient.

When reducing thru the sternum from the middle, it turned into discovered to be quite firm with regular consistency, and the bone marrow was microscopically ordinary inside the sternotomy.

Bone wax was not used for bone marrow homeostasis due to the higher risk of sternum complications in this patient.

When harvesting the LIMA from the sternum environment, this artery had high adhesion in the middle and upper thirds and was only gradually harvested with patience. Overall, compared to other cases of harvesting the LIMA, harvesting time was 80% longer in this case and bleeding was 30% higher as well, but eventually, the LIMA was harvested with good quality and blood flow. CABG procedures were performed as was the routine, and cardiopulmonary bypass was established. A total of five coronary arteries were anastomosed. The LIMA was anastomosed to the left anterior descending artery (LAD) and the saphenous vein was anastomosed separately to obtuse marginatus1 (OM1), the diagonal artery, the posterior descending artery (PDA), and the posterior left ventricle (PLV).

CABG surgery was completed without any major problems. Steel wire size 7 was used to close the sternum bone at the end of the surgery. The wires were placed separately, such that three wires were placed in the manubrium and four in the sternum body.

The patient was discharged with drug tablets ASA 80, Pavix 75, rosevastatin 20, and metoral 50 mg. After discharge from the hospital, the patient recovered without any problems and no chest pain was reported in his 6-month follow-up. The patient's sternum was quite firm and stable. There was no evidence of complications such as malunion or delayed union or infection of the sternum.

3. Discussion

There have been many advances in the diagnosis and treatment of neoplastic diseases and cancers in recent decades. With the improvements in patients' life expectancy and the more effective neoplasm treatments developed, we have now entered a new era of having to deal with senile patients' complications (1, 6).

One of the most common issues is coronary involvement and the resultant need for CABG. This involvement has been reported and its data have been summarized in patients undergoing chemotherapy or radiotherapy (1-3, 6), and the protocols are being changed and revised as the quality of anti-neoplastic drugs and radiotherapy improves (6). Nevertheless, there is still inadequate information on patients who undergo BMT and gradually develop cardiovascular problems similar to other groups with the increase in survival rates.

The patient presented in this study had diffuse large B cell lymphoma, which is one of the most common neoplasms of the lymphatic system (7) and BMT is part of its treatment (8). In patients undergoing BMT, some changes are observed in different organs that had previously been normal (9) or their previous disease gets altered or exacerbated (10) based on follow-ups over several years.

The reported patient also had lymphoma, which was treated with BMT a year before, but no previous examination had been performed before the onset of pain chest and we do not know if the patient's coronary artery stenosis already existed and worsened or had developed over the preceding year. His CABG surgery was performed normally as in other patients (5), but the question was whether to use the LIMA, which is under the sternum and offers a patency that is 2 - 3 times higher than that of the veins. Since the LIMA is responsible for blood supply to part of the sternum, its removal increases complications related to sternum fusion, and patients who have undergone BMT might develop more of these bone-related complications.

Furthermore, the usefulness of the LIMA has been fully demonstrated as a graft in CABG surgeries and the patency of the LIMA graft is 2 - 3 times longer than that of venous grafts (4, 5).

The usefulness of using a LIMA is so great that even in cases where the LAD has been cut due to an accident, it is effective even a few months later and improves heart function (11).

No information was available on the benefits of using the LIMA during CABG in patients undergoing BMT. Therefore, considering the expected survival of more than ten years for this patient, we decided to harvest his LIMA from the sternum to use as a graft.

After the surgery, six months of follow-up showed no incidents or complications related to sternum nonunion, malunion, or infection.

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Footnotes

Authors' Contribution: M. B. was the head of the surgical team responsible for managing the patient's complications. H. G. was a member of the surgical team and helped with the data collection. R. B. was the anesthesiologist involved in this case. S. A. M. and M. H. had a major contribution in the literature search and drafting of the discussion. H. G. drafted the manuscript and provided administrative, technical, and material support. Z. A. A. edited the final draft. All writers contributed to editing the final draft and the approval of the manuscript.

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References

1. Guha A, Dey AK, Kalra A, Gumina R, Lustberg M, Lavie CJ, et al. Coronary Artery Bypass Grafting in Cancer Patients: Prevalence and Outcomes in the United States. *Mayo Clin Proc*. 2020;**95**(9):1865–76. [PubMed ID: 32861331]. [PubMed Central ID: PMC7860624]. https://doi.org/10.1016/j.mayocp.2020.05.044.
2. Carrillo-Estrada M, Bobrowski D, Carrasco R, Nadler MB, Kalra S, Thavendiranathan P, et al. Coronary artery disease in patients with cancer: challenges and opportunities for improvement. *Curr Opin Cardiol*. 2021;**36**(5):597–608. [PubMed ID: 34397466]. https://doi.org/10.1097/HCO.0000000000000878.
3. Moran TB, Plana JC. Management of Patients with Acute Coronary Syndrome and Cancer. *Curr Cardiol Rep*. 2020;**22**(12):159. [PubMed ID: 33037951]. https://doi.org/10.1007/s11886-020-01409-8.
4. Li D, Gu S, Liu Y, Zhang X, An X, Yan J, et al. Outcomes of left internal mammary artery with saphenous vein composite graft to bypass the left anterior descending artery: a propensity-matched study. *J Thorac Dis*. 2020;**12**(11):6629–39. [PubMed ID: 33282364]. [PubMed Central ID: PMC7711400]. https://doi.org/10.21037/jtd-20-2358.
5. Locker C, Schaff HV, Dearani JA, Joyce LD, Park SJ, Burkhart HM, et al. Multiple arterial grafts improve late survival of patients undergoing coronary artery bypass graft surgery: analysis of 8622 patients with multivessel disease. *Circulation*. 2012;**126**(9):1023–30. [PubMed ID: 22811577]. https://doi.org/10.1161/CIRCULATIONAHA.111.084624.
6. Costa I, Andrade FTA, Carter D, Seleme VB, Costa MS, Campos CM, et al. Challenges and Management of Acute Coronary Syndrome in Cancer Patients. *Front Cardiovasc Med*. 2021;**8**:590016. [PubMed ID: 34179121]. [PubMed Central ID: PMC8219848]. https://doi.org/10.3389/fcvm.2021.590016.
7. Rahimi H, Rezaei Borojerdi Z, Ataei Azimi S, Rashidian E, Jafarian A. Prognostic significance evaluation of B-cell lymphoma 2 (BCL2) and Ki-67 expression in diffuse large B-cell lymphoma patients. *Immunopathol Persa*. 2019;**6**(1):e07. https://doi.org/10.15171/ipp.2020.07.
8. Mohammadi SA, Mehrjerdi AZ, Basi A. The value of B-cell lymphoma 2 and CD20 markers for predicting response to treatment and disease recurrence in patients suffering Hodgkin's disease. *J Prev Epidemiol*. 2018;**3**(2):e20.
9. Aref A, Maleknia M, Nasrollahi A, Hajifathali A, Mehdizadeh M, Kazemi H, et al. Incidence of acute kidney injury in bone marrow transplant patients; investigation of consequences within one to three years. *J Ren Inj Prev*. 2020;**10**(2):e10. https://doi.org/10.34172/jrip.2021.10.
10. Gholami F, Ghasemi A, Bahrami AR, Bidkhouri HR, Naderi Mishkin H, Pezeshki Rad M, et al. The therapeutic effect of autologous bone marrow mesenchymal stem cells to prevent the progress of chronic allograft nephropathy. *J Renal Inj Prev*. 2018;**8**(1):1–5. https://doi.org/10.15171/jrip.2019.01.
11. Beheshti Monfared M, Hekmat M, Ansari Aval Z, Ghaderi H, Mirjafari SA, Beheshti Monfared R. Benefits of delayed revascularization following ligation of anterior descending artery after a stab wound. *J Prev Epidemiol*. 2022. https://doi.org/10.34172/jpe.2022.26168.