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Hematopoietic stem cell transplantation in the Sultanate of Oman

Murtadha Al-Khabori *, **Mohammed Al-Huneini**

Hematology Department, Sultan Qaboos University Hospital (SQUH), Oman

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Abstract
The Sultanate of Oman is one of the Arabian Gulf countries with a total population of 4,414,051 as of mid 2016, of which 2,427,825 are Omanis. The gross national income per capita was 7327.7 RO (Omani rial; equivalent to US$19,033) in 2014. There are two hematopoietic stem cell transplantation (HSCT) centers in Oman: the Sultan Qaboos University Hospital (SQUH; allogeneic and autologous) and the Royal Hospital (RH; autologous). HSCT activity in Oman started in 1995 at the SQUH center, which had only one bed, and four cases were performed in that year. The number of allogeneic HSCTs at the SQUH ranged between four and 29 cases per year, of which malignancy was the main indication for transplantation (47%). Most of the transplants were performed from identical sibling donor. T-deplete haploidentical and recently T-replete haploidentical HSCT were also performed at the SQUH center. In the allogeneic HSCT cohort transplanted at the SQUH, the risk of acute graft-versus-host disease (Grades II–IV) was 18%, whereas the risk of extensive chronic graft-versus-host disease was 8%. The HSCT unit at the RH, which started in 2014, performs autologous HSCT procedures only. The number of autologous HSCT cases at the RH ranged between three and 16 cases per year. Limited bed availability is a frequent obstacle to HSCT in Oman. Construction of a much larger national HSCT center is about to be completed, which will likely improve access to transplant services in Oman.

Introduction

The Sultanate of Oman is one of the Arabian Gulf countries with a total population of 4,414,051 as of 2016, of which 2,427,825 are Omanis [1]. As of 2014, the gross national income (GNI) was 29,984.8 RO (Omani rial) and the GNI

* Corresponding author.
E-mail address: khabori@squ.edu.om (M. Al-Khabori).

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per capita was 7327.7 RO (US$19,033). The country is served by two hematopoietic stem cell transplantation (HSCT) centers located in the two largest tertiary care hospitals in Muscat, the capital of Oman: Sultan Qaboos University Hospital (SQUH) and Royal Hospital (RH). Most of the population lives in the north and south parts of Oman, and most of the other parts are sparsely populated. The distance that some patients will need to travel to reach the transplant centers may exceed 500 and 1000 km coming from the north and south parts of the country, respectively.

Sultan Qaboos University Hospital

The SQUH HSCT center opened in 1995. Both allogeneic and autologous HSCT procedures are performed in this center. The center started with a single bed high-efficiency particulate air filtered unit and performed four transplant operations in 1995. The unit thereafter increased to two beds, and currently has four beds, and performs 25–28 allogeneic pediatric and adult HSCTs per year. The number of transplants has steadily increased over the years. The autologous stem cell transplantations are performed in the single rooms of pediatric and adult hematology wards. The total number of pediatric and adult allogeneic HSCTs performed was 348 as of early November 2016. Most of the transplants done at SQUH center are allogeneic (81%), followed by autologous HSCTs (19%). The vast majority of donors are identical sibling donors (84%), followed by haploidentical donors (15%), and only a small proportion matched related donors (2%).

The indications of allogeneic HSCT in the SQUH center vary. The largest proportion of transplants was for malignancies (mostly acute leukemia), at 47%, followed by primary immunodeficiency and bone marrow failure disorders, at 29%. Transplants for hemoglobinopathies (sickle cell disease and thalassemia major) constituted 23% of the indications. In the allogeneic HSCT cohort, the rate of acute graft-versus-host disease (aGvHD) was 32%, of which 14% were only Grade I. The rate of Grade II, III, and VI aGvHD was 11%, 5%, and 2%, respectively. The rate of chronic GvHD (cGvHD) was low–8% in both limited and extensive cGvHD.

There is a high prevalence of hepatitis B virus (HBV) core antibody positivity in the cohort treated with immunosuppression at SQUH, and it is not uncommon that these patients would require antiviral prophylaxis to decrease the risk of reactivation. We have encountered patients who reactivated hepatitis C virus (HCV) infection after allogeneic HSCT with very high viral load and who were in need of specific anti-HCV therapy. The false positive results of Toxoplasma IgG are seen in some donors, which lead to delay in some of the transplants because of the uncertainty of the diagnosis. This is likely related to the very sensitive tests used at our center for Toxoplasma IgG. No cases of transplant-associated *Toxoplasma* infection were seen in our cohort. Infections with multidrug-resistant bacteria are more commonly encountered with increasing frequency recently. This has contributed to the morbidity and mortality in our patients.

The cost of HSCT in Oman is fully covered for Omanis by the government; this applies to both autologous and allogeneic transplantations. For patients not covered by the government, insurance or a third party usually covers the cost. The cost of allogeneic and autologous HSCTs is 35,000 RO and 20,000 RO, respectively. There are a number of obstacles that we and the patients face prior to, during, and after the transplantation. Our transplant unit currently has four beds, and the waiting time is long for patients with hemoglobinopathies. We frequently send patients to undergo the procedure outside the country owing to the limited bed availability. Some of the medications we use for the preparative regimen are nonformulary, and it may take a long time to order and receive the required medications. This is also true for the T-cell depletion antibodies in T-deplete haploidentical HSCT. Finally, many patients transplanted at our center have to travel a long distance to reach the transplant center, and this becomes even more troublesome early after transplant with frequent daycare and clinic visits.

SQUH and RH are members of the Eastern Mediterranean Blood and Marrow Transplantation. Additionally, SQUH is also an associate member of the European Society for Blood and Marrow Transplantation (EBMT). Most of the ongoing research activity and output are single-center retrospective studies. A prospective study of optimization and validation of the busulfan pharmacokinetic model incorporating the genetic polymorphism is underway. A mesenchymal stem cell production optimization project is also ongoing. SQUH has recently gained accreditation from the Accreditation Canada International (ACI). However, the transplant center does not have Foundation for the Accreditation of Cellular Therapy (FACT) or Joint Accreditation Committee-ISCT & EBMT (JACIE) accreditation yet.

Work is in progress to optimize the performance and access to transplant centers in the country. A new national transplant center is about to be completed, and this new center will have a 22-bed transplant unit for pediatric and adult allogeneic HSCT. Additionally, work is in progress to develop a national cord blood bank and unrelated registry for HSCT donors. We also plan to attain full membership with the EBMT.

Royal Hospital

The RH HSCT started in 2014 and performs autologous transplants only. The total number of transplants performed up to early 2016 was 29 for multiple myeloma (16 cases), Hodgkin's (10 cases), and non-Hodgkin's lymphomas (3 cases). The average number of transplants is 10 per year. The RH has recently attained ACI accreditation. However, the transplant center does not have FACT of JACIE accreditation yet.

Conclusion

There are two HSCT centers in Oman: SQUH, which performs allogeneic and autologous transplant procedures; and RH, which performs autologous transplants. The center at SQUH started in 1995 and mostly performs allogeneic transplants with identical sibling donors. The rates of aGvHD and cGvHD are low. Both SQUH and RH have attained ACI accreditation, but none of them is FACT or JACIE accredited. A large

national HSCT center is about to finish, which likely will improve access to HSCT transplant in the country.

Conflict of interest

None.

References

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