

Changes in Bone and Glucose Metabolism in Patients Post Solid organ Transplant

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ABSTRACT

Introduction: Solid organ transplantation has emerged as a pivotal therapeutic option for various organ failures and has gained more popularity with newer technologies and better immunosuppressive options. However, immunosuppressive therapies for survival of solid organ transplant is also associated with various metabolic complications with changes in bone and glucose metabolism. The aim of our study is to review the changes in bone and glucose metabolism in post solid organ transplant recipient Veterans.

Methods: Single center, retrospective study with subjects who had solid organ transplant conducted at William Jennings Bryan Dorn Veteran Hospital in Columbia, South Carolina. All available subjects who had solid organ transplant between January 1, 2008 till December 31st, 2017 and had at least one post-transplant followed up visit were included. Data was collected from computerized patient record system after approval by Institutional Review board (IRB) and Research and development. Collected data included age, sex, BMI, Laboratory data, Medications, Bone mineral density (BMD) by DXA, Diabetes status and medications pre and post operatively.

Results: Data collected include 227 patients with solid organ transplants. Out of those, only 88 had BMD evaluation and only 45 had follow up BMD. Out of 88 with baseline BMD, 16 had osteoporosis, 36 had osteopenia and 36 had normal BMD. Although 51 were on Bisphosphonates, many of them did not have follow up DXA scans. 157 were receiving Vitamin D supplementation but very few had levels checked. A total of 158 patients had Diabetes, with 95 having pre-existing diabetes and 52 were diagnosed post transplantation. The time of onset was unknown in 11 patients. Majority of patients with pre-existing diabetes required intensification of their medications for diabetes to achieve optimal glycemic control.

Discussion: A multitude of factors including type of transplant, individual pre-operative metabolic profiles, choice of immunosuppressive agents and certain infections increase the risk of these metabolic complications. Given the complex post-operative care, issues with immunosuppressive agents and other comorbidities, metabolic bone disease and other complications may go unnoticed and under recognized which may later lead to higher risk of fractures, morbidity and mortality.

Conclusion: This study highlights the importance of monitoring prudently for metabolic changes after solid organ transplantation. Early identification and aggressive management of these complications may help decrease morbidity and mortality related to fractures and sub-optimal glycemic control.

INTRODUCTION

- Solid organ transplantation has emerged as a pivotal therapeutic option for various organ failures and has gained more popularity with newer technologies and better immunosuppressive options.
- However, immunosuppressive therapies for survival of solid organ transplant is also associated with various metabolic complications with changes in bone and glucose metabolism.
- The aim of our study is to review the changes in bone and glucose metabolism in post solid organ transplant recipient Veterans.

METHODS

- Single center, retrospective study with subjects who had solid organ transplant conducted at William Jennings Bryan Dorn Veteran Hospital in Columbia, South Carolina. All available subjects who had solid organ transplant between January 1, 2008 till December 31st, 2017 and had at least one post-transplant followed up visit were included.
- Data was collected from computerized patient record system after approval by Institutional Review board (IRB) and Research and development. Collected data included age, sex, BMI, Laboratory data, Medications, Bone mineral density (BMD) by DXA, Diabetes status and medications.

RESULTS

- Data collected include 227 patients with solid organ transplants. Out of those, only 88 had BMD evaluation and only 45 had follow up BMD. Out of 88 with baseline BMD, 16 had osteoporosis, 36 had osteopenia and 36 had normal BMD.
- Although 51 were on Bisphosphonates, many of them did not have follow up DXA scans. 157 were receiving Vitamin D supplementation but very few had levels checked.
- A total of 158 patients had Diabetes, with 95 having pre-existing diabetes and 52 were diagnosed post transplantation. The time of onset was unknown in 11 patients. Majority of patients with pre-existing diabetes required intensification of their medications for diabetes to achieve optimal glycemic control.
- Out of 52 patients with post-transplant diabetes, 33 (63.4%) required Insulin therapy.

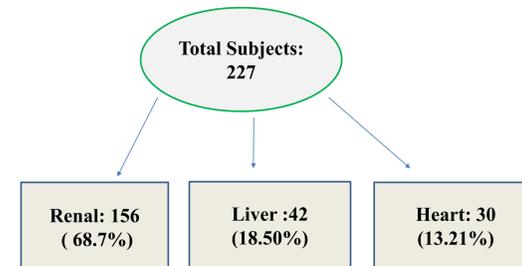


Figure 1: Distribution based on type of Transplant

| Parameters | Mean ± SD |
|---------------------|--------------|
| Age | 66.7 ± 9.3 |
| BMI | 28.1 ± 5.9 |
| Measured Age | 59.2 ± 9.3 |
| L1-L4 | 1.226 ± 0.2 |
| T score Spine | 0.3 ± 1.7 |
| BMD Left Neck | 0.898 ± 0.17 |
| T score Left Neck | -1.0 ± 1.3 |
| BMD Right Neck | 0.907 ± 0.2 |
| T Score Right Neck | -1.0 ± 1.2 |
| Total Sample Number | 88 |

Table 1: Baseline BMD parameters

| Parameters | Mean ± SD |
|---------------------|-------------|
| Interval (months) | 33.9 ± 22.3 |
| L1-L4 | 1.213 ± 0.2 |
| T score Spine | 0.2 ± 1.7 |
| BMD Left Neck | 0.881 ± 0.2 |
| T score Left Neck | -1.1 ± 1.2 |
| BMD Right Neck | 0.895 ± 0.2 |
| T score Right Neck | -1.0 ± 1.2 |
| Total Sample Number | 45 |

Table 2: Follow up BMD Parameters

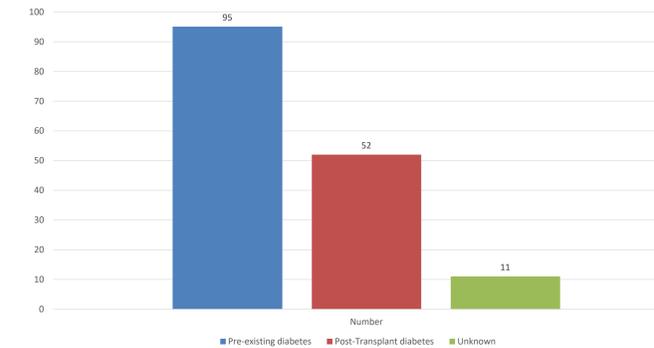


Figure 2: Distribution of diabetes

| Patient group | Number (n) / Total in the group |
|--|---------------------------------|
| Pre-existing diabetes on Insulin prior to transplant | 60 / 95 (63.1%) |
| Post-Transplant Diabetes requiring Insulin | 33 / 52 (63.4%) |
| Unknown timing of Insulin | 14/95 (14.7 %) |

Table 3: Insulin requirements in patients with diabetes

DISCUSSION

- The pathophysiology underlying bone disorders after transplantation results from a complex interplay of factors, including preexisting renal disease in most patients and bone loss related to a variety of causes, such as immunosuppression and alterations in the parathyroid hormone-vitamin D-fibroblast growth factor 23 axis as well as changes in mineral metabolism.
- Earlier studies after kidney transplantation indicate that bone mineral density (BMD) declines by 4%–10% in the first 6 months , with a further decrease of 0.4%–4.5% in lumbar BMD between 6 and 12 months.
- Given the complex post-operative care, issues with immunosuppressive agents and other comorbidities, metabolic bone disease and other complications may go unnoticed and under recognized which may later lead to higher risk of fractures, morbidity and mortality. Our study also indicates this as majority of patients did not have any baseline BMD measurements and very few had appropriate follow ups.
- Similarly, poor glycemic control post-transplant can increase the risk of infections and other complications amongst this patient population and prudent monitoring is needed for identification of post-transplant diabetes and need for intensification of therapy.

CONCLUSION

- This study highlights the importance of monitoring prudently for metabolic changes after solid organ transplantation.
- Early identification and aggressive management of these complications may help decrease morbidity and mortality related to fractures and sub-optimal glycemic control.

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