

## Introduction

Adding fat grafts to crushed septal cartilage in rhinoplasty has been shown to have a solid association with strong graft retention, rapid swelling resolution, and patient satisfaction, However, there is a paucity of translational research on what the septal chondrocytes are secreting in the presence of fat grafts.

## Objectives

- To investigate how IL-4, IL-10, IL-13, and TGF-Beta cytokines may modulate inflammation released from crushed septal cartilage grafts in the presence of autologous fat.

## Methods

- Septal cartilage and abdominal fat grafts were obtained from 15 patients at Yale-New Haven Hospital, New Haven, CT.
- Sample groups were separated into 6 groups with half containing a mixture of cartilage and fat.
- Cartilage groups were also separated into uncrushed, delayed crushed, and crushed groups.
- Samples groups were cultured in 5 mL of MEM- $\alpha$  serum-free medium for a total of 48 hours.
- 1ml of supernatants were extracted and replaced at 12, 24, and 48 hours.
- Supernatants were subjected to ELISA for cytokine level quantification in triplicates.

## Results

| Duration       | Cartilage Stage +/- fat graft | Graphic symbols |
|----------------|-------------------------------|-----------------|
| 12/24/48 hours | Uncrushed                     | 12/24/48-u      |
| 12/24/48 hours | Uncrushed + fat graft         | 12/24/48-uf     |
| 12/24/48 hours | Delayed crush                 | 12/24/48-d      |
| 12/24/48 hours | Delayed crush + fat graft     | 12/24/48-df     |
| 12/24/48 hours | Crushed                       | 12/24/48-c      |
| 12/24/48 hours | Crushed +fat graft            | 12/24/48-cf     |

Graph Legends

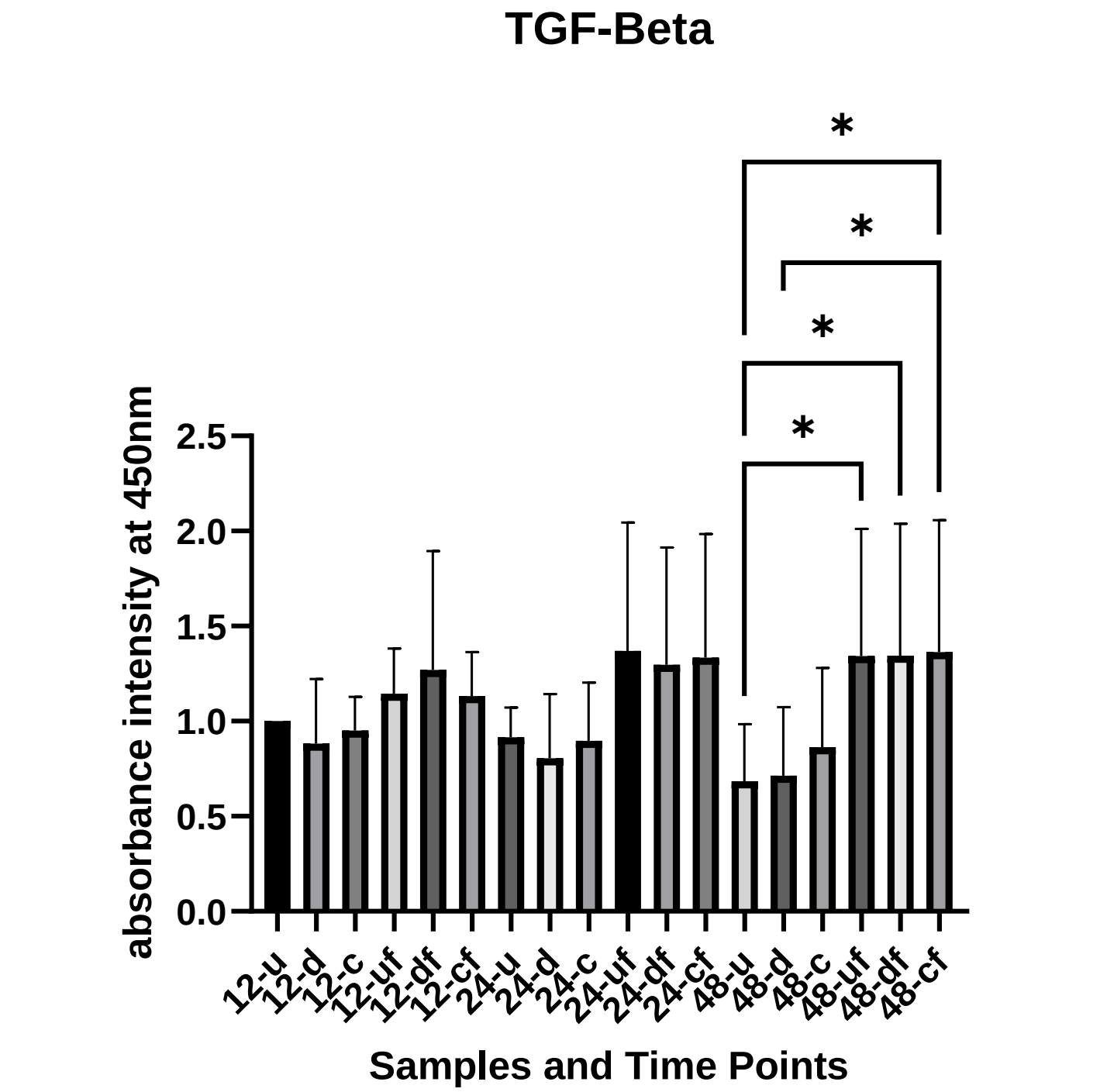
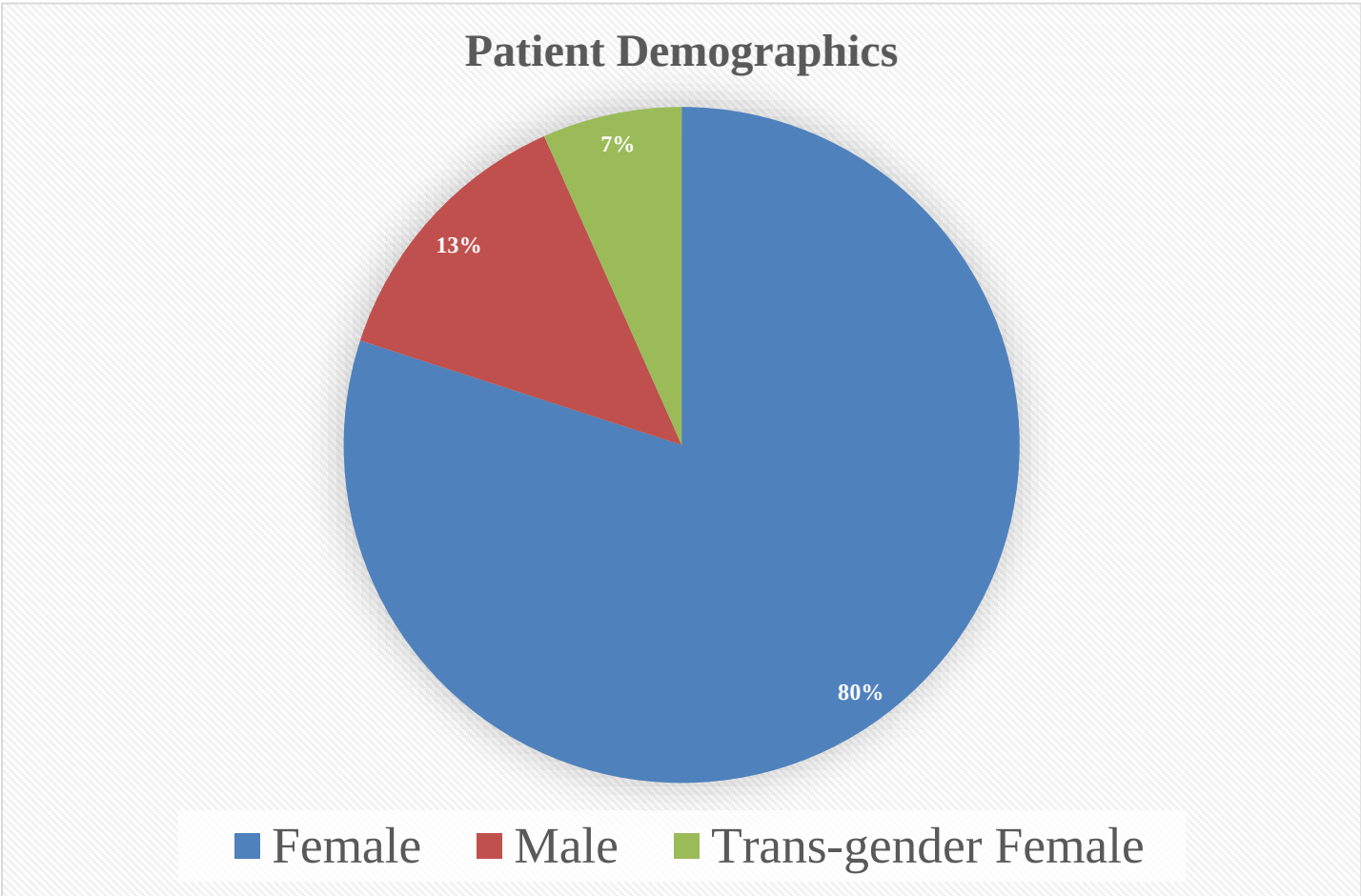


**Figure 2:** At the 48-hour mark, all the cartilage groups with autologous fat exhibited greater TGF-Beta secretion than uncrushed cartilage without autologous fat. (48-u versus 48-uf *p value= 0.03*)

## Conclusion

- Fat grafts co-culturation do not change septal cartilage IL-4 and IL-10 secretion profile.
- Fat graft aided the sustained release of IL-13 and TGF-Beta.
- IL-13 and TGF-Beta are involved in wound healing, chondroprotective properties, chondrogenic differentiation and anti-inflammation
- These findings demonstrated the potential cellular symbiotic process of fat graft and crushed cartilage that may explain the superior clinical results of using fat grafts in rhinoplasty

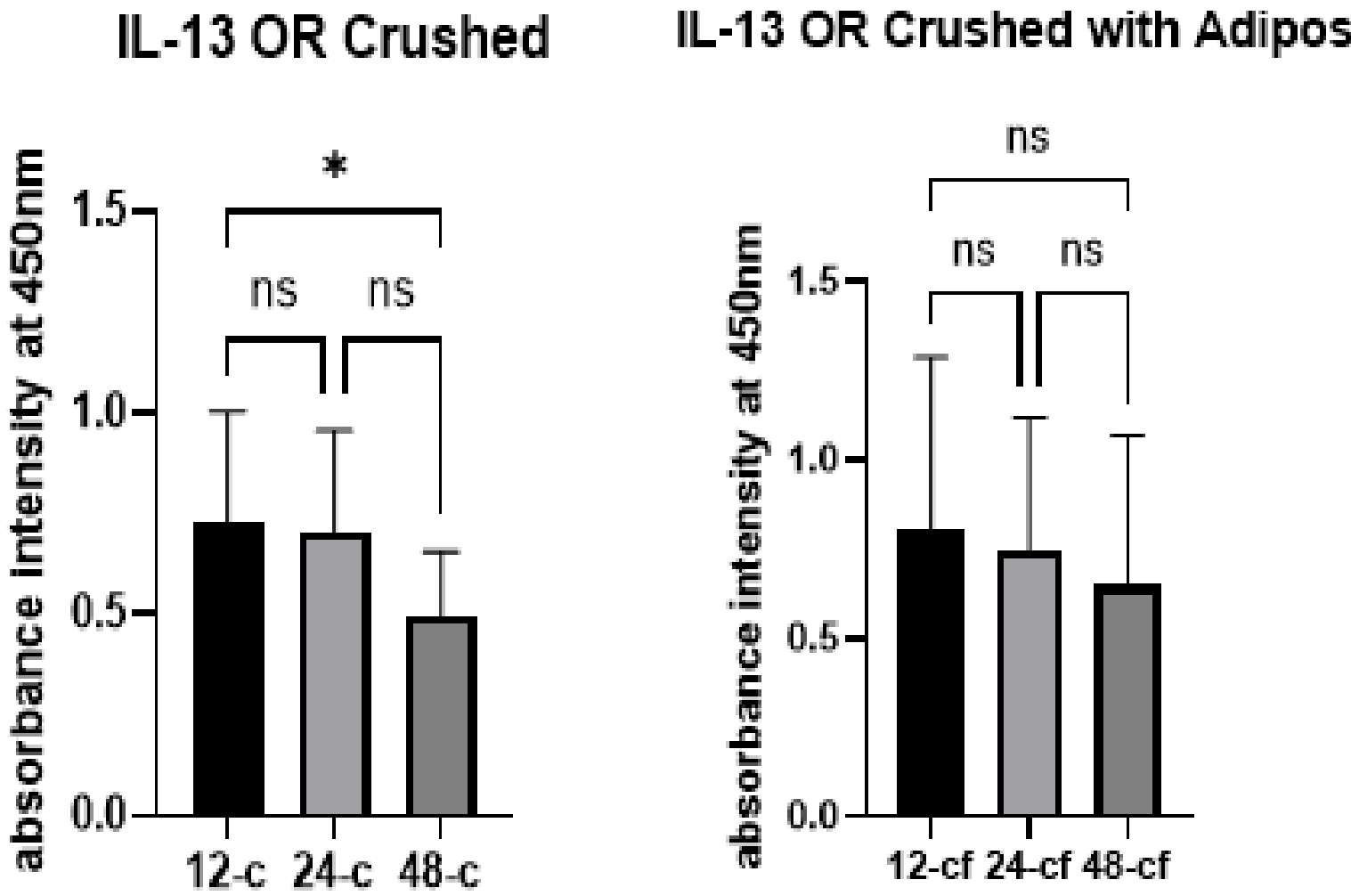


**Figure 1:** IL-13 secretion over the study period in cartilage crushed in the OR incubated with or without autologous fat. IL-13 secretion was significantly reduced by the 48-hour mark in cartilages that were incubated without autologous fat. (*p value= 0.043*). IL-13 was not significantly reduced in crushed cartilage incubated with autologous fat.

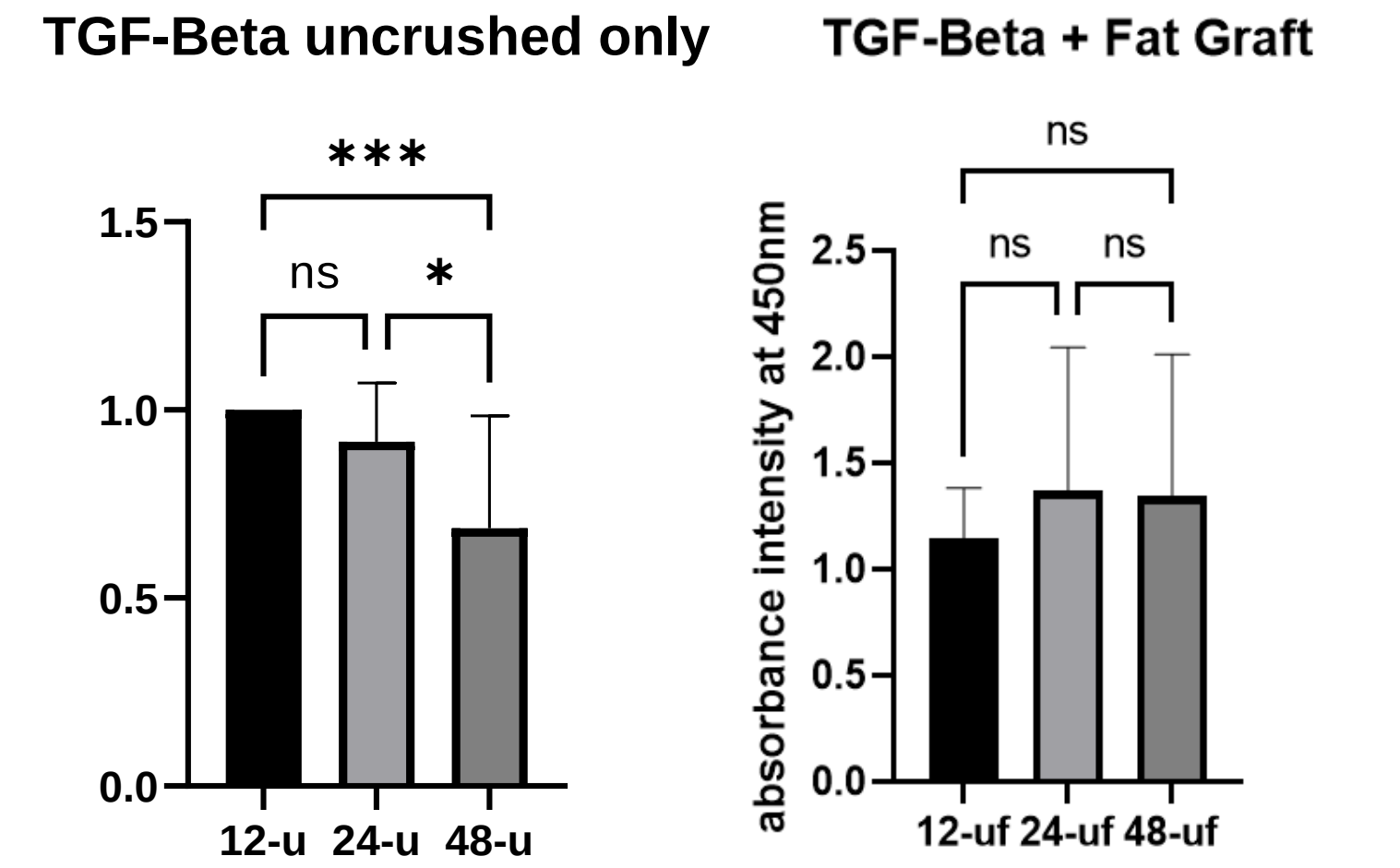


**Figure 3:** TGF-Beta secretions profiles of uncrushed cartilage without autologous fat. With increasing incubation length, we observed a significant reduction in TGF-Beta secretion by the 48-hour mark. (24-u versus 48-u: *p value=0.011* and 12-u versus 48-u: *p value=0.0008*). Figure 3c: ELISA of cartilage TGF-Beta secretions profiles of uncrushed cartilage with autologous fat. The cartilages throughout the entire incubation period were able to maintain a constant degree of TGF-Beta secretion.

## Future Studies

- Future directions of study should be analyzing the effects of autologous fat on long-term outcomes of cartilage grafts.
- This may also be applicable in the field of tissue engineering.