Rates and type of reoperation following application of hexapod external fixator within the United States

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INTRODUCTION: Hexapod external fixation remains a rare operation within the United States reserved for patients with large-volume bone loss and stabilization with correction of complex multiplanar and rotational deformities. While outcomes are overall satisfactory in a variety of use-cases, no large population analysis has been completed to understand basic patient demographics, time-frame, rate and types of reoperations among patients undergoing hexapod frame placement.

METHODS: Utilizing the TriNetX database of over 100 million US patients, patients were identified who underwent Current Procedural Terminology (CPT) code 20696 - application of multiplane external fixator with stereotactic computer-assisted adjustments. The cohort was then analyzed for basic demographics and fracture patterns, followed by timeframe of treatment, number of adjustments requiring OR, timing of adjustments and total duration of treatment.

RESULTS: 1573 patients across 49 HCOs underwent CPT 20696 within the United States, dating back as early as 2006 within the TriNetX database. Mean age of patients undergoing hexapod fixation was 42 years old (± 20 years), with 60% of the patients being male, 64% white abc 18% black. The most common lower extremity fracture patterns associated with hexapod use include tibial shaft fractures (18%) and pilon fracture (9%), among other non-specific proximal and distal tibial and fibular fracture patterns. Talar and calcaneal fractures were each present in 3% of the cohort. 815 patients (61%) underwent removal without repeat OR visit for adjustment, occuring at a mean 111 days (± 85 days). 387 patients (30%) required one OR adjustment prior to removal at a mean of 188 ± 120 days, and 22 patients required 2+ OR adjustments prior to definitive removal at a mean of 662 ± 301 days. All other patients did not have a defined treatment path.

DISCUSSION AND CONCLUSION: Hexapod frame application remains a relatively rare procedure within the United States despite acceptable outcomes when used appropriately. The majority of patients undergoing hexapod frame application have tibial shaft or pilon fractures, while a small minority were found to have talus or calcaneus fractures. While most patients undergo frame removal at approximately 3 months, 30% of patients require OR adjustment of the frame, which can significantly prolong the course of therapy. Prospective, multi-center studies should be completed to better understand the natural history of frame application, adjustment and removal in order to better inform patients of the treatment course required.

Table 1. Basic demographics and fracture patterns among patients who underwent CPT 20696 within the United States.

Demographics	Percentage cohort	Number patients
Age at index	42 +/- 20	1573
Male	60%	939
Female	33%	524
White	64%	1008
Black	18%	289
Fracture Patterns		
Pilon (S82.87)	147	9%
Trimalleolar (S82.85)	95	6%
Other fractures of lower leg (S82.83)	174	11%
Other fractures of upper and lower end of fibula (S82.83)	154	10%
Tibial shaft fracture (S82.1)	287	18%
Proximal tibial fracture (S82.2)	141	9%
Distal tibial fracture (S82.3)	136	9%
Talar fracture (S92.1)	48	3%
Calcaneus fracture (S92.0)	44	3%