Background
The cross over or overlapping 2nd toe can be a significant source of pain and deformity, and a challenge for foot surgeons. Multiple techniques have been described to fix it, including recent increased interest in devices that repair the plantar plate from the dorsal approach. Many studies document the plantar approach has been described, but limited studies with patient follow up. Some have argued that the plantar incision causes a painful scar and should be avoided. The primary author (CC) has been performing a direct repair trough a plantar approach for many years and has long term follow up results. The purpose of the study is to analyze long term subjective and objective clinical findings of plantar plate repairs through a plantar incision.

Materials and Methods
This is a retrospective review of 146 patients / 166 feet who underwent a direct plantar plate repair through a plantar approach, with detailed radiographic evaluation. 73 patients / 75 plantar plate repairs completed a follow up survey detailing subjective findings. This survey included prior treatments, presence of callus before and after, pain improvement after surgery, and satisfaction with the procedure. All patients had at least one year follow up data.

A direct plantar plate repair was performed through an incision in the plantar skin over the metatarsal head. Care is taken to make an en bloc incision through the skin and fat, to maintain the fat pad. The plantar plate defect (attenuation or rupture) is suture repaired under direct visualization with nylon suture. Adjunct procedures are noted, as this procedure is rarely performed alone. Partial weight-bearing in a surgical shoe was permitted immediately following surgery.

Results
Demographic data: average age 57.8 years; 87% female; 96% Caucasian; follow-up average was 48 months with a range of 12-115 months. Additional procedures: 60% of patients had a 1st ray procedure, 90% had a PIP joint arthrodesis, and 24% a metatarsal osteotomy. Radiographic angular assessment revealed an average 14° sagittal and 3.2° transverse plane correction. Subjective findings available in 73 patients / 75 plantar plates revealed 70% very satisfied, 20% satisfied with minor reservation, 0% satisfied with major reservations, and 10% unhappy. On average patients had 91% improvement after the surgery. 72% had an increased level activity after surgery, and 12% noted worse activity level. 84% of patients reported they would have the same procedure performed on the other foot if necessary. 82.6% of patients would recommend the surgery to another family member. 55% of patients had previous treatment, 12 % were diagnosed with a neuroma, 12% had received an injection, 12% said the injection made it worse, and 14% even had prior surgery. 36% of patients had a prop callus, with 42% of patients developing a post op callus. Of those with a preop callus, 55% said the callus remained the same, 26% said the callus was less, and 14% reported worse callus. 91% of patients reported that they had no pain or stiffness of the 2nd toe after surgery. Painful plantar scar was reported in only 5% of the patients.

Conclusion and Discussion
As far as we know, this is the largest study with long term follow up on the direct plantar approach to repair plantar plate injuries. Even in the patients who still had a callus after surgery, subjective findings were that patients had significant pain relief, and stiffness was a minimal complaint as well. The majority of patients would recommend this procedure to a relative and would have it done on the other foot if necessary. Multiple procedures have been used in treating the cross-over 2nd hammertoe. Recent suture/anchor devices are being used dorsally to repair the insufficient plantar plate. Prior authors have presented studies on this technique with short-term reviews. The plantar incision approach with direct repair of the plantar plate has limited data in the literature. It has been argued that the plantar incision causes painful scar tissue and should be avoided. Our experience using a direct plantar incision approach to treating this condition appears effective in correcting sagittal plane insufficiency of the plantar plate, with very few problems from the plantar scar, while providing a high level of patient satisfaction. This study can be used as a reference for future discussions and decisions about using the plantar incisional approach for repairing the plantar plate.

References
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