Gutter impingement is a frequent complication following total ankle replacement. Osteophyte and heterotopic ossification are the most common causes of gutter impingement. Gutter disease is more common in the lateral gutter than the medial gutter. Gutter disease can lead to pain, swelling, and reduced function. The goal of this study was to identify the incidence and type of gutter disease in primary total ankle replacements at our institution and to elucidate the treatment of gutter disease.

Methodology and Study Design
A retrospective chart review was performed of all primary TAR cases at our institution performed from 2008-2014. A total of 191 TARs were performed by a single surgeon. Follow up ranged from one to seven years following TAR. Cases requiring surgical intervention for gutter disease were identified. Operative reports, patient charts, and diagnostic imaging were reviewed to elucidate the type and incidence of gutter impingement as well as the treatment.

Procedures
Gutter impingement was treated surgically either through open medial and lateral ankle arthrotomies in 12 cases (32.4%) or through an anterior ankle arthrotomy in 25 cases (67.6%) (Figures 3-8). Ancillary procedures often included lateral ankle stabilization with peroneus tendo graft, Brostrom lateral ankle stabilization, suretage and grafting of bone cysts, polyethylene exchange, gastrocnemius recession, deltoid release and sometimes exchange or down sizing of tibial or talar components.

Discussion and Literature Review
Gutter impingement following total ankle arthroplasty has been reported in a number of studies. Additionally there is a high rate of revision surgery due to symptomatic gutter disease following TAR. Gutter impingement is not exclusive to any one total ankle replacement system, however, all but two TAR’s requiring gutter resection in this study were mobile bearing. In a study of 489 TARs by Schuberth et al., there was a 7% incidence of gutter impingement. However, they found that when they excluded a semi-constrained implant requiring syndesmosis fusion, 18% required subsequent gutter resection compared to only 2% who had gutter resection performed during the index procedure. In a study by Krause et al., 12 of 114 (10.5%) TARs had medial or lateral gutter impingement. In our study where patients did not have prophylactic gutter resection, the rate of secondary gutter disease was comparable to the study by Schuberth et al., but higher than in the study by Krause et al.

Results
Out of 191 TARs there were 37 that required debridement for gutter impingement making the overall incidence of gutter disease 19.4%. Clinically gutter pain may be vague and difficult to localize with direct palpation. Caution should be taken with the use of diagnostic injections due to risk of periprosthetic infection. Gutter disease etiology could be classified in our study as fibrous or osteophytic, sometimes mixed. This distinction was not made previously described in the literature. Though purely osteophytic disease was easily identified on plain radiographs, advanced imaging, especially SPECT CT, was helpful in identifying fibrous or mixed disease (Figures 1-3). Given the appearance on SPECT CT, this fibrous disease is felt to represent an inflammatory type of impingement which may be initially overlooked on a benign appearing plain radiograph. This difference in appearance was also noted intraoperatively. While preemptive gutter resection may be indicated, complications can occur with overzealous gutter resection. The rate of intraoperative medial malleolar fractures during TAR has been 20% and prophylactic pinning has been recommended. In a study by Schimmell et al. 134 mobile bearing TARs were reviewed comparing the complications in the first 50 compared to the last 50. There were three gutter impingements in both the first and last 50 patients, suggesting that even with experience it is difficult to gauge the adequate amount of gutter resection that is necessary. Ultimately determining the right balance of gutter resection intraoperatively is paramount in reducing revisional procedures and complications.

Table 1. Gutter disease characteristics and treatment approach.

<table>
<thead>
<tr>
<th>Etiology</th>
<th>No. of cases</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Fibrous</td>
<td>18</td>
<td>46.9%</td>
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<tr>
<td>Osteophytic</td>
<td>20</td>
<td>54.1%</td>
</tr>
<tr>
<td>Mixed</td>
<td>3</td>
<td>8.1%</td>
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</tbody>
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References

Figure 1. SPECT CT with medial and lateral gutter involvement
Figure 2. SPECT CT with lateral gutter involvement
Figure 3. SPECT CT with medial gutter involvement
Figure 4. MRI pre gutter resection with medial gutter impingement
Figure 5. MRI post gutter resection for medial gutter impingement
Figure 6. Ankle pre-TAR
Figure 7. Pre gutter resection of medial gutter impingement
Figure 8. TAR post gutter resection