# Rate of Avascular Necrosis after Femoral Lengthening with Internal Lengthening Nails

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INTRODUCTION:
There has been historic concern that the use of intramedullary nails (IMN) in the pediatric population could present undue risk of avascular necrosis (AVN) of the femoral head due to compromise of the femoral blood supply. Intramedullary lengthening nails are rapidly becoming commonplace in lengthening procedures. Here we sought to characterize the incidence of AVN in femoral lengthening nails as well as characterize other adverse events in these procedures.
The primary objective of this study was the retrospective analysis of rates of avascular necrosis in the pediatric population following femoral lengthening. Secondary objectives were to analyze general complications as well as characterize general trends in femoral lengthening.
METHODS:
This retrospective cohort study evaluated patients who have undergone femoral lengthening at a single institution. Retrospective chart review and radiographic evaluation of AVN was conducted. The primary end point was radiographic evidence of avascular necrosis. Secondary variables of starting point of the femoral nail, total amount of lengthening, time to consolidation, adverse events relating to lengthening were also evaluated.
RESULTS:
There were 324 patients included for analysis. Of these included, there was no patients who had radiographic evidence of avascular necrosis (0%) or coxa valga (0%). The average lengthening was 4.57cm (range 1-8.5 cm). No patients developed any extensive complication, such as alterations in the proximal femoral anatomy. No patients showed radiographic evidence of AVN at three, six- and 12-months follow up. There were 226 patients who had any form of complication with 185 having a mild complication able to be resolved without additional procedures, 58 required additional procedure but were able to meet preoperative treatment goals, 13 had complications requiring additional procedure but did not meet treatment goals, and 9 had complications that resulted in condition worse than preoperative condition.
DISCUSSION AND CONCLUSION:
Avascular necrosis is an infrequent complication of femoral lengthening and is a well-tolerated procedure with the vast majority of additional complications capable of resolution without additional procedures. This is the largest study to date in the investigation of complications following femoral lengthening using intramedullary lengthening nails.

**Radiographic (Evidence of Avascular Necrosis or Coxa Vara) * Insertion Crosstabulation**

Count

| | | Insertion | | | |
|---|---|---|---|---|---|
| | | Intercondylar | Piriformis | Trochanteric | Total |
| Radiographic (Evidence of Avascular Necrosis or Coxa Vara) | No AVN | 82 | 59 | 183 | 324 |
| | AVN | 0 | 0 | 0 | 0 |
| Total | | 82 | 59 | 183 | 324 |