Despite recent advances in ankle arthroplasty, ankle arthrodesis is still considered to be the gold standard treatment for end-stage ankle arthrosis. Recent progress in arthroscopic techniques has led to equivalent fusion rates and patient reported outcome measures when compared to open techniques - traditionally the gold standard. We look to add to a growing body of evidence supporting the use of arthroscopic ankle arthrodesis (AAA) in a large single surgeon cohort.

A retrospective clinical and radiographic assessment was conducted on 47 consecutive patients (48 ankles) undergoing AAA by a single surgeon between 2014 and 2019. The primary outcome was time to union, fusion rate, and re-operation rates. Secondary outcomes were preoperative and postoperative coronal and sagittal plane alignment, antero-posterior talar shift (measured as tibial axis to talus ratio), length of stay, followup visits, operation times, complication rates and relation of body habitus and medical comorbidities to fusion rates.

Our cohort demonstrates union rates of 96% with a low incidence of both early and intermediate term complications. Length of stay, analgesic requirements and soft tissue complications all compared favourably to published outcomes in open ankle fusion. We demonstrated that signiýcant corrections in alignment - in both the coronal and sagittal planes can be achieved through arthroscopic techniques. Mean coronal plane alignment of 4.5° (range 71 to 109, S.D 5.2), mean sagittal plane alignment of 7.1° (range 97 to 121 S.D 6.5) and mean T:T ratio correction of 6.1% (range 10-53 S.D 9.7) was achieved.

AAA is a safe and reliable procedure with high union rates and low complication rates with outcomes that are at least equivalent to traditional, more invasive open techniques. Our ýndings are in keeping with an emerging body of evidence supporting the continued use of AAA in ankle arthrodesis, even in the setting of signiýcant deformities.

Keywords

A o o i n o i ; An o i ; 0 -1.2 T [( )3 ( )3 ( )0.5 ( )-9 ( )-5 (n)0.5 ( )-6 ( )4 ( )0.5 ( )8 (o)7 ( )0.5 ( )5 (

Operative Technique

A in o on n n in n i , i n i o- i ion in on o in , i o i o i ion on o in i . A i o ni i , n i in L oy D i o . A non-in i n i o i i i i ion i n y. T o in i ion , n o n n o i , o in in o ¡oin . A 4.0 o o i i n on i n o ¡oin in 4.5 yno- o . C i n o oi o o o i y in oin in o i . O ion y n n io ¡oin yno o y i o . i o o , i i n , y 4.0 io ioni n n ion in i io- in in fi - n o x o n yin - in on . Join ion o i o n i i in o o - n o i in o n n o i o - in o . Wi i in n ifi i n , n i o i ion in n o i ion n o i ion fix ion i i in oo 3.2

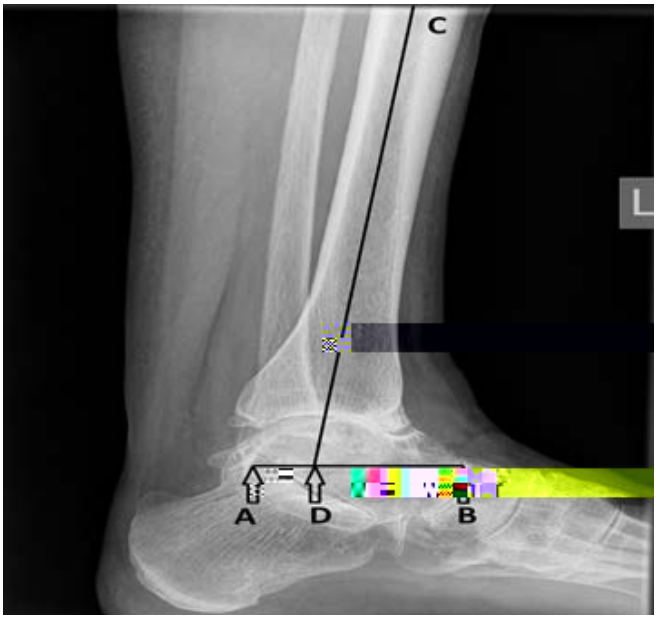
n i K- i n n o oxi y 45 o i i on xi . Fo o in i , i i in n ifi i n , o i y 7.0 n i nn n - o y o i o i i o (Fi 1). P n - ion o ;oin i oi o i in n ifi nin n in o i ini x in ion. Fo o in o n i i ion, o i o in n o n in , o - n i i .

Placement of two medial parallel screws from tibia to talus, in a single plane on the coronal axis, with no extrusion into the subtalar joint. The alignment of the ankle is kept as near to neutral as possible in the lateral and frontal plane.

Postoperative protocol

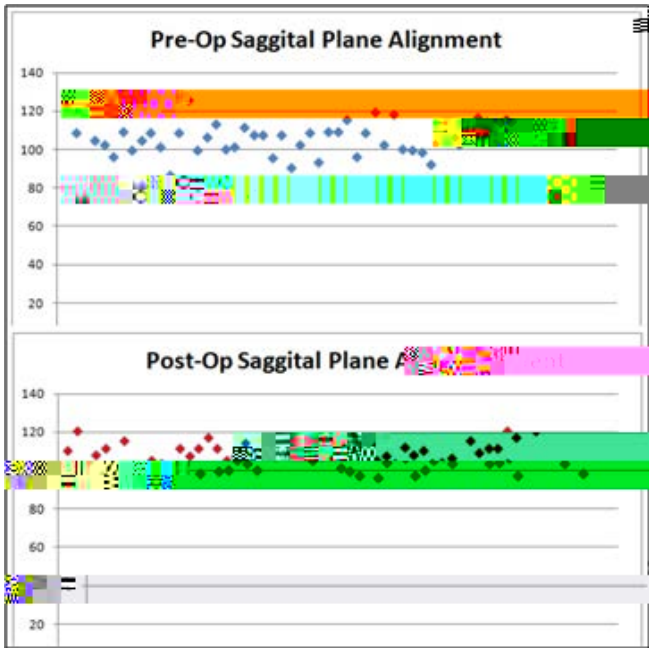
P i n no y o o ni i n i i n n o y n in . Fo o in y io y n o ion i ' n , i n o in y i o on y on o o i y. P i n o i A i in 150 on i y i o i PPI. P i n in o in i y non i - in on o i i i o i i ion i (/). Fo o - i 2 o o n in ion, on o o - n o o i n X-R y ion. S i non i in i i o

The Sagittal Alignment angle (SAA) deýned by the intersection of lines along the tibial anatomic axis (CD), and another drawn from the most inferior aspect of the posterior tubercle of the talus to the most inferior aspect of the neck of talus (AB).

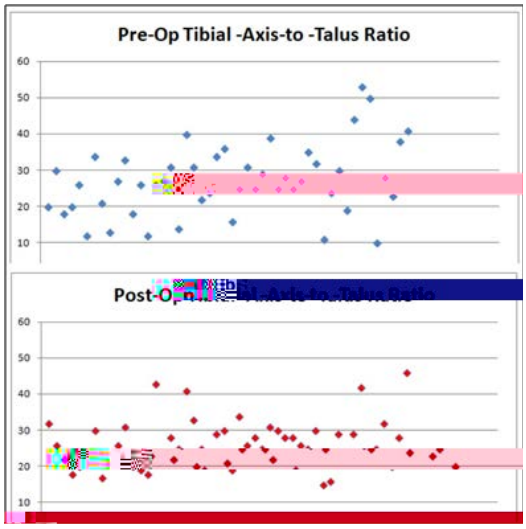


The Tibial Axis-to-talus (T: T) Ratio, the ratio into which the midlongitudinal talar length-expressed as a percentage (AD/AB X100).

o 258.8 y (S.D 81.6). T o o ony nion onfi y
CT nnin n non o fi i in n ion. W o
2 o non- nion in o o , o 4%. On o i n
o i n o i o o in n o - ni i i i
, i y i i o o o y. i i n o



Pre and Post-Operative Sagittal Plane Alignment (degrees).



Pre and Post-Operative Tibial-Axis-to-Talus Ratio (%).

Mean Pre-Op FAA (degrees)	91.7 (n ,76-116; SD 7.3)
Mean Post-Op FAA (degrees)	89.9 (n , 71-109; SD 5.2)
Mean Coronal Plane Correction (degrees)	4.5 (n , 1-16; SD 3)
Mean Pre-Op SAA (degrees)	106.8 (n , 87-126; SD 8.4)
Mean Post-Op SAA (degrees)	107.6 n , (97-121; SD 6.5)
Mean Sagittal Plane Correction (degrees)	7.12 T [(( )-6 ( )-3 ( )T[T]109; SD46.5)

L n 101 o G n 111	20	1	NS
Post-Op SAA			
106 +/-5	25	1	NS
L n 101 o n 111	21	1	NS
Pre-Op T: T Ratio (percentage)			
27 o 42	20	1	NS
L n 27 o n 42	26	1	NS
Post-Op T: T Ratio			
27 o 42	21	1	NS
L n 27 o n 42	25	1	NS

Correlation of clinical and radiographic variables with union

Discussion

W o n x n nion in o o o o 96% i 85% o - in i in 6 on n 11% o in i in y o o i y. i i in in i y i nion o in i o AAA i nion n in o 97% [3,5,9,10]. Hi nion n o i ion o i i AAA i o OAA - o o ini i in i ion o ony on o n o i n o ion i , n o ion o o i i fix ion i [11,12]. Non nion i 41% n o i ion o o 50% n o i i OAA o in o x n i in i- ion , o n i i nifi n ony ion n i fix ion - ni [6,13].

fi y i i on i o i on in 2017 n o i o on o i o o y n 5 o i o o i - o o 286 i n . i i i i i n i i o n x in y n o i - o n o i o in 2013. i y i i on AAA o i i i ion , o o ni i , n o n o y n o o o n n ion [14]. W i i y o i i n n in i nifi n o o y - i in o on ion o o in o AAA.

D i o y i , n i o o, n i o o i i o >10 n on i i on in i ion o AAA; o , n i AAA n o o on n o i i , i o ion o o on n o i i o o 36 i in on y [15-18]. To n n o on n o i i o n i o i in o i o o o o i y n in i i i o . W i i n i n . A ; oin ion i o i ionin o i o i ion i - i fix ion io o o n i o o ion o o 16 in o i .

i i ion o i i . Fi y, o y - o i , i no on o o o o i OAA o o , n no i n ifi o o . In i ion, o ini nion ; y on n io o i nion y in io y on i ; i , o , o in o n o o . I i i y o y i n o o on ion o n on o o n y i o o i n io i o in nion . W i o i y o , , n o i on o - i n i o onfi AAA i o i ni o n ion in o xi i in n ion o o , i in ion n ini i in o i ion .

Acknowledgement

o o ;o n i o n nony o - i o i o n n ion .

Author's Contribution

D No n N on i o D o ion, i - i , n i in . M M C in, MRCS o on S i i n y- i , i i in n i in . M J P o i o on i in D o ion, i n o o - n i in . D U n M - oo on P in o o - o . V on n o in o i n o on o in i in o ion in y. O i n i n P o . R i i M Nio i' S i ion n G i n .

Declaration of Con ict of interest

o no in o on i o in .

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