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# Immediate and late outcomes of percutaneous transluminal angioplasty in Buerger's disease patients with lower extremity artery disease



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## Disclosure

Speaker name: Young-Guk Ko

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I have the following potential conflicts of interest to report:

- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)
  
- I do not have any potential conflict of interest



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# Buerger's disease (Thromboangiitis obliterans)

- an occlusive, segmental, non-atherosclerotic, thrombotic vasculitis that commonly involves small- and medium-sized segmental arteries, superficial veins, nerves of extremities.
- typically presents in young male (<45 years of age) smokers.
- more prevalent in the Middle East and Far East.
- little data on the outcomes of endovascular treatment in patients with Buerger's disease.



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# Diagnostic Criteria

Age under 45 yr

Current or recent history of tobacco use

Presence of distal extremity ischemia indicated by claudication, pain at rest, ischemic ulcers, or gangrenes and documented by noninvasive vascular testing

Exclusion of autoimmune diseases, hypercoagulable states, and diabetes mellitus

Exclusion of a proximal source of emboli by echocardiography or arteriography



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# Study Population

- Between January 2006 and May 2016, a total of 44 Buerger's disease patients with lower extremity artery disease with 50 target limbs underwent PTA in Severance Cardiovascular Hospital.



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# Baseline Clinical Characteristics

|                                    | Total<br>(n=44) | Procedural success<br>(n=35) | Procedural failure<br>(n=9) | p      |
|------------------------------------|-----------------|------------------------------|-----------------------------|--------|
| Age, yrs                           | 40.4 ± 9.6      | 41.0 ± 9.6                   | 37.9 ± 9.7                  | 0.393  |
| Male                               | 43 (97.7)       | 34 (97.1)                    | 9 (100.0)                   | 1.000* |
| <u>Duration of illness, months</u> | 42.1 ± 44.2     | 34.0 ± 41.3                  | 74.7 ± 42.1                 | 0.008  |
| Hypertension                       | 4 (9.1)         | 2 (5.7)                      | 2 (22.2)                    | 0.180* |
| Diabetes mellitus                  | 0 (0)           | 0 (0)                        | 0 (0)                       |        |
| Hypercholesterolemia               | 12 (27.3)       | 10 (28.6)                    | 2 (22.2)                    | 1.000* |
| Chronic kidney disease             | 1 (2.3)         | 0 (0)                        | 1 (11.1)                    | 0.205* |
| Coronary artery disease            | 3 (6.8)         | 3 (8.6)                      | 0 (0)                       | 1.000* |
| Smoking                            |                 |                              |                             | 0.488  |
| Never                              | 0 (0)           | 0 (0)                        | 0 (0)                       |        |
| Current                            | 30 (68.2)       | 23 (65.7)                    | 7 (77.8)                    |        |
| Former                             | 14 (31.8)       | 12 (34.3)                    | 2 (22.2)                    |        |
| Previous angioplasty               | 19 (43.2)       | 16 (45.7)                    | 3 (33.3)                    | 0.710* |
| Previous bypass surgery            | 6 (13.6)        | 5 (14.3)                     | 1 (11.1)                    | 1.000* |
| Previous limb amputation           | 7 (15.9)        | 5 (14.3)                     | 2 (22.2)                    | 0.619* |
| Critical limb ischemia             | 38 (86.4)       | 31 (88.6)                    | 7 (77.8)                    | 0.400  |
| Rutherford classification          |                 |                              |                             |        |
| Category 3                         | 6 (13.6)        | 4 (11.4)                     | 2 (22.2)                    |        |
| Category 4                         | 19 (43.2)       | 13 (31.1)                    | 6 (66.7)                    |        |
| Category 5                         | 17 (38.6)       | 16 (45.7)                    | 1 (11.1)                    |        |
| Category 6                         | 2 (4.5)         | 2 (5.7)                      | 0 (0)                       |        |
| <u>CRP, mg/L</u>                   | 1.9 (0.8~7.1)   | 3.0 (1.3~9.1)                | 0.7 (0.2~1.1)               | 0.001  |



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# Lesion & Procedural Data I

|   | Total<br>(n=44) | Procedural<br>Success (n=35) | Procedural<br>Failure (n=9) | p      |
|---|-----------------|------------------------------|-----------------------------|--------|
| Limbs                                       | 50              | 40                           | 10                          |        |
| Diseased levels                             |                 |                              |                             |        |
| Iliac                                       | 2 (4.0)         | 2 (5.0)                      | 0 (0)                       | 1.000* |
| Femoropopliteal                             | 32 (64.0)       | 25 (62.5)                    | 7 (70.0)                    | 0.659  |
| Infrapopliteal                              | 50 (100)        | 40 (100)                     | 10 (100)                    | 1.000  |
| Multilevel disease                          | 31 (62.0)       | 25 (62.5)                    | 7 (70.0)                    | 0.659  |
| Number of patent<br>run-off tibial arteries | 0.6 ± 0.6       | 0.5 ± 0.6                    | 0.6 ± 0.5                   | 0.820  |
| Pedal arch type                             |                 |                              |                             | 0.334  |
| Type 1                                      | 2 (4.0)         | 2 (5.0)                      | 0 (0)                       |        |
| Type 2A or 2B                               | 23 (46.0)       | 20 (50.0)                    | 3 (30.0)                    |        |
| Type 3                                      | 25 (50.0)       | 18 (45.0)                    | 7 (70.0)                    |        |
| Pre-PTA ABI                                 | 0.6 ± 0.3       | 0.6 ± 0.3                    | 0.5 ± 0.3                   | 0.457  |
| Local thrombolysis                          | 6 (12.0)        | 5 (12.5)                     | 1 (10.0)                    | 1.000* |
| Clinical success                            | 38/50 (76.0)    | 38/40 (95.0)                 | 0/10 (0)                    | -      |
| <del>Post-PTA ABI</del>                     | 0.9 ± 0.3       | 0.9 ± 0.2                    | 0.6 ± 0.3                   | 0.034  |
| Complications                               |                 |                              |                             |        |
| Vessel perforations                         | 5 (10.0)        | 2 (5.0)                      | 3 (30.0)                    |        |
| Distal embolization                         | 1 (2.0)         | 0 (0)                        | 1 (10.0)                    |        |





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# Lesion & Procedural Data II

|                          | Total<br>(n=44) | Procedural<br>Success (n=35) | Procedural<br>Failure (n=9) | p      |
|--------------------------|-----------------|------------------------------|-----------------------------|--------|
| Target arteries          | 88              | 77                           | 11                          |        |
| Iliac                    | 2               | 2                            | 0                           | 1.000* |
| Total occlusions         | 2/2 (100)       | 2/2                          | -                           |        |
| ISR                      | 2/2 (100)       | 2/2                          | -                           |        |
| TASC II D                | 1/2 (50)        | 1/2                          | -                           |        |
| Stenting                 | 1/2 (50)        | 1/2                          | -                           |        |
| Lesion technical success | 2/2             | 2/2                          |                             |        |
| Femoropopliteal          | 32              | 25                           | 7                           | 0.659  |
| Total occlusions         | 32/32 (100)     | 25/25                        | 7/7                         |        |
| ISR                      | 3/32 (9.3)      | 2/25                         | 1/7                         |        |
| TASC II D                | 22/32 (68.8)    | 15/25                        | 7/7                         |        |
| Subintimal approach      | 12/32 (37.5)    | 10/25                        | 2/7                         |        |
| Stenting                 | 6/32 (18.8)     | 6/25                         | 0/7                         |        |
| Lesion technical success | 25/32 (78.1)    | 25/25                        | 0/7                         |        |
| Infrapopliteal           | 54              | 50                           | 4                           | 1.000  |
| ATA                      | 23/54           | 20/50                        | 3/4                         |        |
| PTA                      | 23/54           | 22/50                        | 1/4                         |        |
| Peroneal                 | 8/54            | 8/50                         | 0/4                         |        |
| Total occlusions         | 54/54 (100)     | 50/50                        | 4/4                         |        |
| TASC D                   | 54/54 (100)     | 50/50                        | 4/4                         |        |
| Subintimal approach      | 15/54 (27.8)    | 13/50                        | 2/4                         |        |
| Stenting                 | 0/54 (0)        | 0/50                         | 0/4                         |        |





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# Medication at Hospital Discharge

|                                       | Total<br>(n=44) | Procedural<br>success<br>(n=35) | Procedural<br>failure<br>(n=9) | p      |
|---------------------------------------|-----------------|---------------------------------|--------------------------------|--------|
| Aspirin                               | 38 (86.4)       | 31 (88.6)                       | 7 (77.8)                       | 0.400  |
| Clopidogrel                           | 22 (50.0)       | 19 (54.3)                       | 3 (33.3)                       | 0.457* |
| Cilostazol                            | 28 (63.6)       | 20 (57.1)                       | 8 (88.9)                       | 0.077  |
| Aspirin + clopidogrel                 | 20 (45.5)       | 17 (48.6)                       | 3 (33.3)                       | 0.477* |
| Aspirin + cilostazol                  | 25 (56.8)       | 18 (51.4)                       | 7 (77.8)                       | 0.155  |
| Aspirin + clopidogrel +<br>cilostazol | 12 (27.3)       | 9 (25.7)                        | 3 (33.3)                       | 0.687  |
| Prostanoid                            | 24 (54.5)       | 18 (51.4)                       | 6 (66.7)                       | 0.413  |
| Warfarin                              | 21 (47.7)       | 19 (54.3)                       | 2 (22.2)                       | 0.137* |
| Calcium channel blocker               | 11 (25.0)       | 9 (25.7)                        | 2 (22.2)                       | 1.000  |
| Nitrate                               | 5 (11.4)        | 3 (8.6)                         | 2 (22.2)                       | 0.267* |
| Statin                                | 23 (52.3)       | 16 (45.7)                       | 7 (77.8)                       | 0.086  |



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# Predictors of Procedural Failure

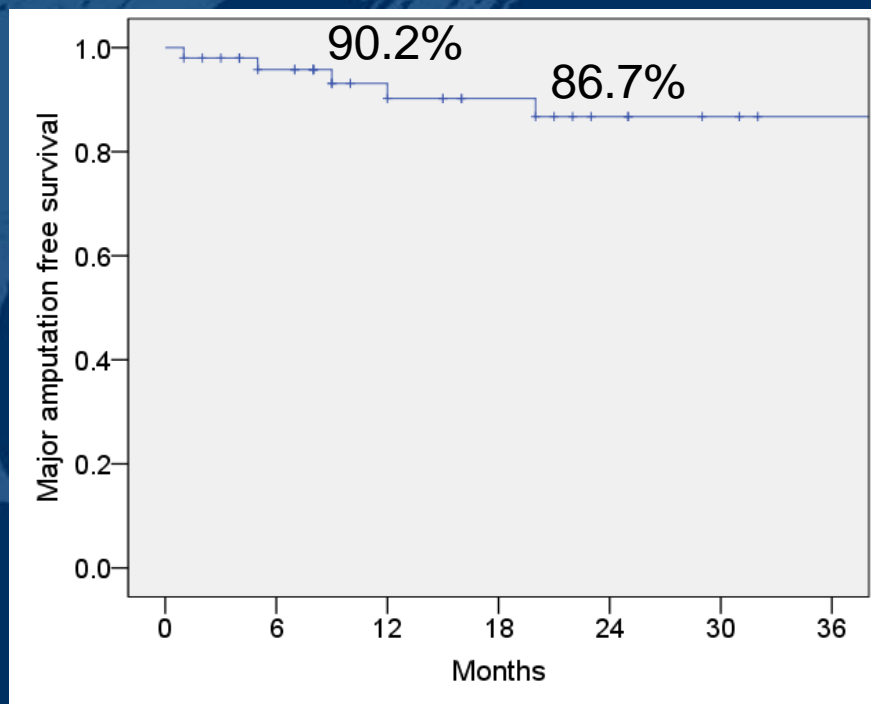
|                               | Univariate analysis |         | Multivariate analysis |         |
|-------------------------------|---------------------|---------|-----------------------|---------|
|                               | HR (95% CI)         | P-value | HR (95% CI)           | P-value |
| LogCRP                        | 0.05 (0.00 ~ 0.58)  | 0.017   | 0.03 (0.00 ~ 0.71)    | 0.030   |
| Duration of illness           | 1.02 (1.00 ~ 1.04)  | 0.014   | 1.03 (1.00 ~ 1.06)    | 0.063   |
| Rutherford 5/6                | 0.10 (0.01 ~ 0.87)  | 0.037   | 0.17 (0.01 ~ 2.95)    | 0.223   |
| Pedal arch type 3 at baseline | 2.85 (0.64 ~ 12.64) | 0.168   | 4.27 (0.38 ~ 47.73)   | 0.238   |



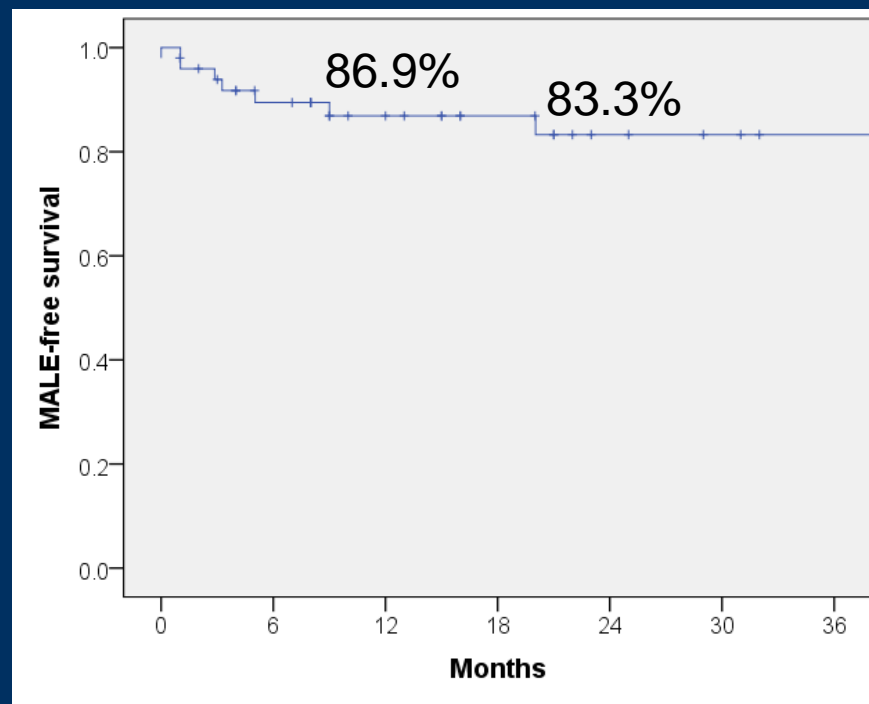
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# Clinical Outcomes I

## Limb Salvage



## MALE-free Survival

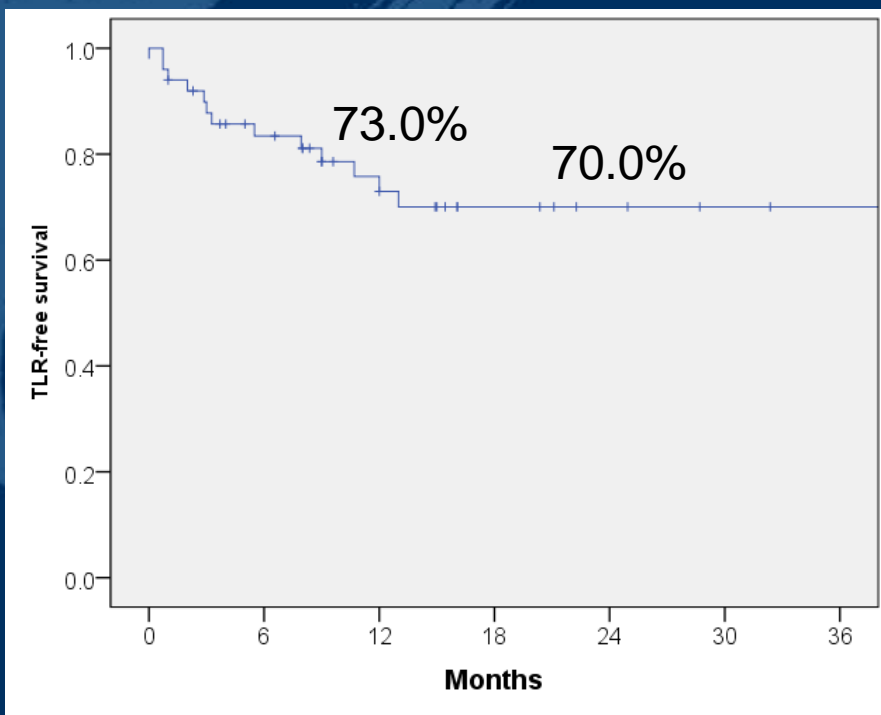




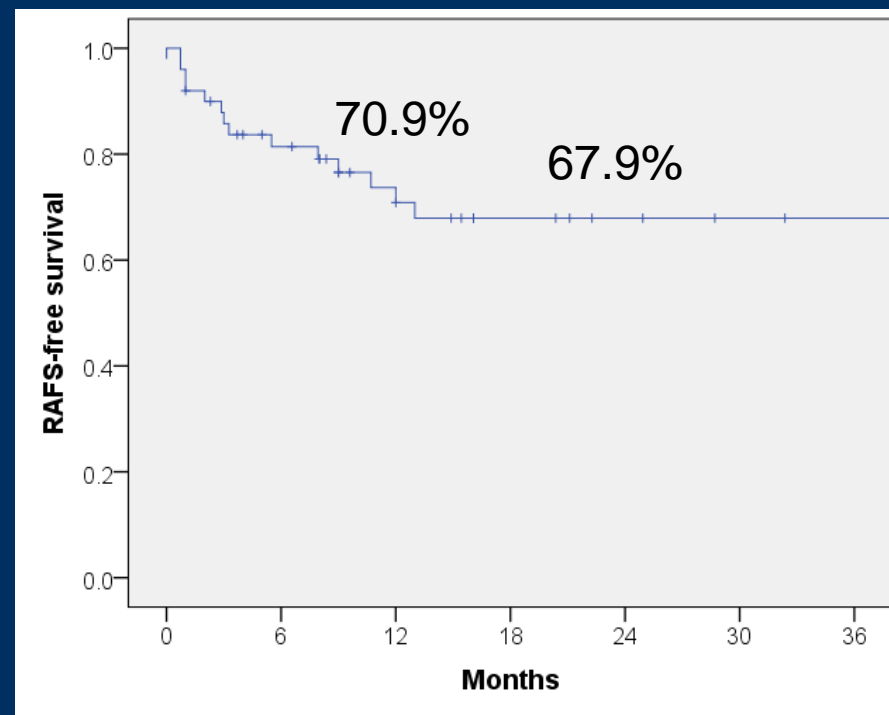
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# Clinical Outcomes II

## TLR-free Survival



## Reintervention-amputation-free survival





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# Predictors of Any Reintervention or Amputation

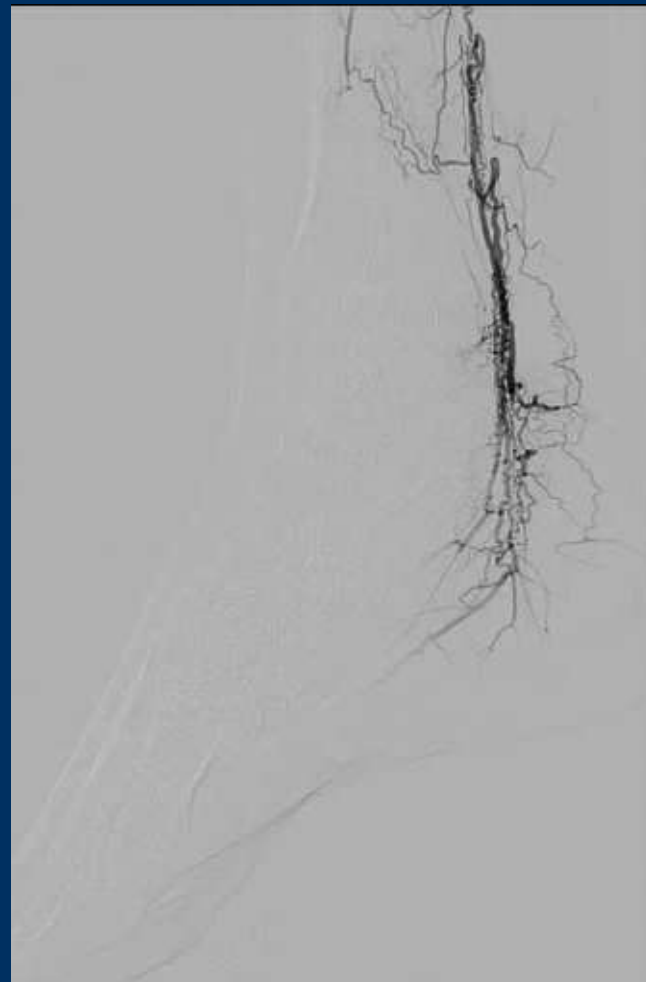
|                               | Univariate analysis |         | Multivariate analysis |         |
|-------------------------------|---------------------|---------|-----------------------|---------|
|                               | HR (95% CI)         | P-value | HR (95% CI)           | P-value |
| Continuous smoking after PTA  | 3.91 (1.25 ~ 12.23) | 0.019   | 2.26 (0.70 ~ 7.38)    | 0.175   |
| Previous PTA                  | 2.57 (0.95 ~ 6.92)  | 0.062   | 3.70 (1.20 ~ 11.31)   | 0.022   |
| Previous amputation           | 3.86 (1.31 ~ 11.36) | 0.014   | 4.68 (1.37 ~ 15.96)   | 0.014   |
| Pedal arch type 3 at baseline | 2.88 (1.00 ~ 8.31)  | 0.050   | 2.79 (0.95 ~ 8.17)    | 0.062   |



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M/47

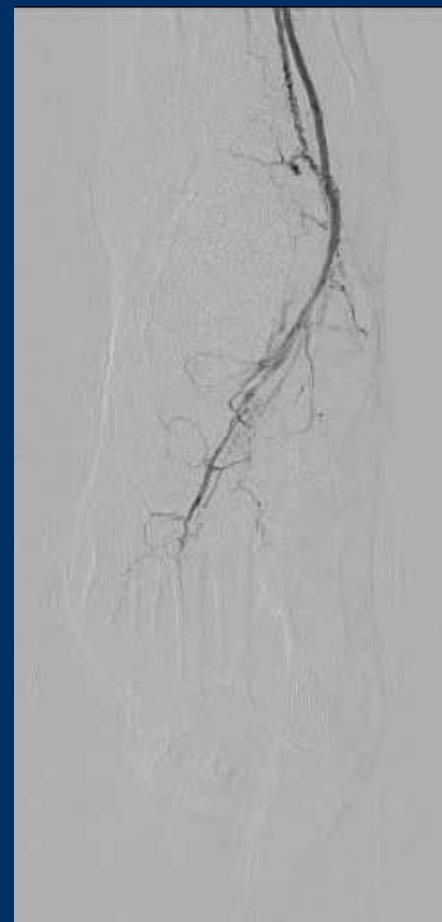
Rutherford 4  
ABI 0.8





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# After angioplasty







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# M/44

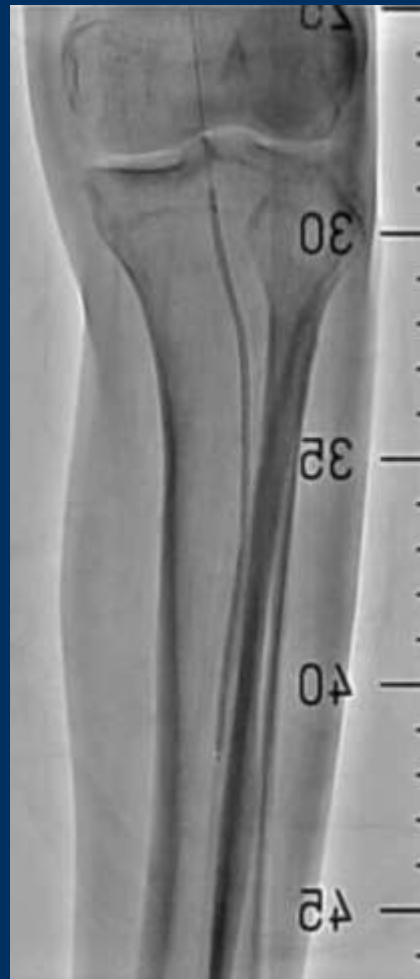
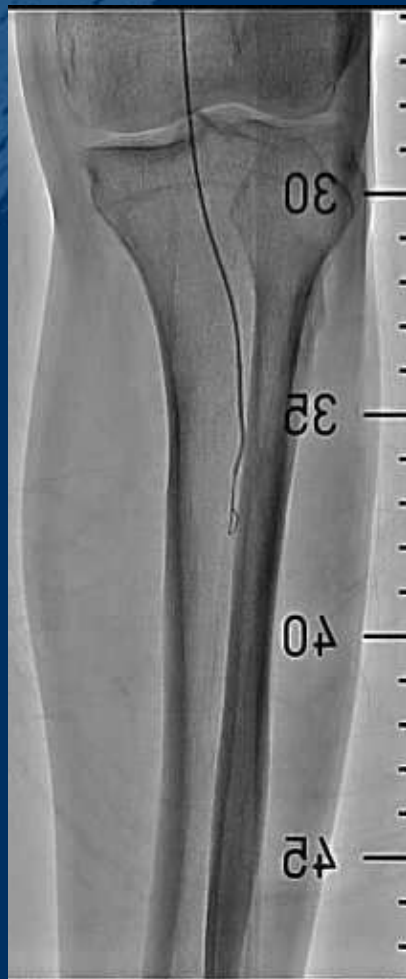
Rutherford 5, ABI 0.2





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# Subintimal Angioplasty





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# Result





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# Summary

- In patients with Buerger's disease, PTA was feasible with favorable immediate and late outcomes without significant complications.
- Elevated CRP, a potential indicator of active inflammatory disease state, was a predictor of procedural success. In addition, shorter duration of illness showed a trend towards higher success.
- Previous amputation and previous angioplasty were predictors of decreased RAFS and type 3 pedal arch type at baseline also showed a trend towards decreased RAFS.



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# Conclusion

- In patients with Buerger's disease, PTA was an effective and safe strategy of recanalization.
- Especially, in patients with shorter duration of illness and elevated CRP, angioplasty showed a higher procedural success rate.
- However, we need a new strategy to reduce restenosis and reintervention after successful PTA.



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