Malalignment Syndrome in Runners

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**Discussion:**

This paper represents a paradigm shift in the typical care and evaluation of long-distance runners. The nature of running injuries tend to be overuse syndromes with slow, chronic onset and the causes are often specific to runners themselves, even if the injury can be seen in other populations as well. Recognition of the importance of biomechanics in the etiology, assessment, and treatment of running injuries continues to evolve. Standard clinical assessment and physical therapy will miss the underlying malalignment present in many of these injuries. This paper represents a clinical perspective on some of the available evidence and practical management of malalignment.

Malalignment includes the biomechanical changes, abnormal stresses, and resulting signs/symptoms seen with pelvic and resultant lower extremity malalignment. Understanding malalignment is essential for those caring for runners, as approximately 80% have pelvic malalignment, which can mimic, trigger, or aggravate many common injuries. Inclusion of several osteopathic screening exams and self-assessment and self-treatment are essential to allow the runner to establish and maintain alignment on a daily basis.

Understanding of common patterns of malalignment and their relationship to biomechanics is essential to properly diagnosing and treating these injuries. For example, a right anterior, left posterior innominate can be associated with the following: right malleolus will move superiorly when moving from lying to sitting, left innominate inflare, externally rotated right femur, internally rotated right tibia, right genu valgum, increased pronation of right foot, and C-type spinal curve rotated right, sidebent left. This can predispose to right-sided plantar fasciitis, Achilles tendinosis, lateral OA, short leg, patellofemoral compartment syndrome, and Osgood schlatters. On the left-side, lateral ankle strain, tibial stress fracture, shin splints, medial OA, long leg, IT band syndrome, hip OA, and proximal hamstring tendinopathy. Asymmetries in muscle bulk can also be appreciated, although this should not be reason to assume selective strengthening is necessary to correct it. Correction of malalignment first is necessary prior to initiating traditional strengthening and physical therapy exercises, as the malalignment will only continue to persist and may worsen as it can be further reinforced through strengthening.

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**Discussion Points:**

1. What do you think some of the important history-taking factors are for patients with running-related injuries?
2. What would your osteopathic screening exam look like for malalignment-related running injuries? What would you treat first?
3. Which osteopathic treatments can be adjusted to be used by the patient as a single-person technique?
4. What else could you look for on physical exam?
5. What do you think would be some ‘red flags’ in a patient’s history that would point to an etiology of malalignment?
6. What do you think would be some common injuries caused by malalignment?
7. Whom should the responsibility of diagnosis and assessment of malalignment rest with? The medical doctor or the physical therapist/chiropractor?
8. What would a running gait analysis add to your static assessment of malalignment? When do you think a gait analysis would be most helpful?
9. What are some suggestions you could tell runners to help them prevent malalignment and biomechanically related injuries?

**Discussion Answers:**

1. When assessing for running injuries, in particular with malalignment, a few key points come to mind:

-First of all, was the cause of the injury directly related to running? There is a difference between a runner who pulled their hamstring running and a runner who pulled their hamstring while playing pick-up basketball. An injury directly related to running more strongly supports the need to consider their biomechanics and malalignment in the etiology and treatment of their injury.

-Is the injury unilateral? Unilateral suggests asymmetrical forces imposed on the lower extremity, which suggests malalignment

-Is there more than just one injury? Are there other areas of soreness? It is important to understand that pretty much all running injuries that are directly caused by running are overuse injuries, so their onset tends to be insidious and not overtly obvious. It is almost always that a runner will have warning signs of an impending injury that they have learned to ignore. Long-distance runners learn that there is a certain level of pain and discomfort they have to learn to run through, so being sure to clarify and be very direct about any soreness or unusual sensations they may have or are experiencing.

-What is their history of injuries? Goes along with above. A long history of injuries strongly supports undiagnosed and untreated malalignment. One of the greatest risk factors for a running injury is a history of a running injury

-Have they spent any significant portion of their running career on the roads? If so, do they typically run on the same-side of the road, i.e. against traffic? This is a big known risk factor for malalignment as roads are cambered and result in asymmetrical forces imposed on the lower extremity.

1. Assessing ASIS, PSIS, lying and sitting medial malleoli heights (sitting-lying test) are probably most essential and will provide you with information on innominate rotation/flare and overall presence of malalignment. Further screening of the lumbar/thoracic spine for rotational abnormalities and the pubic symphysis for the presence of a shear.
2. Self-administered muscle energy treatments for innominate inflare/outflare and anterior/posterior innominate can be easily taught and are probably the most important to address
3. Outside of standard physical exam, I would suggest looking at their shoes for differences in wear, looking at their calves/quads for atrophy/hypertrophy of one side.
4. This question goes with number 1 above.
5. This is a broad list. I would not say there is a single running injury that could not be caused by malalignment. If an injury is bilateral however, it is unlikely to be caused by malalignment.
6. This is an opinion question, but an important one as the diagnosis and assessment of malalignment very much so falls within a gray-zone between the professions of medical doctor, physical therapist, and chiropractor. A clinician’s ability and comfort in assessing malalignment will very likely be highly dependent on the individual as these are not currently standardized components of education for any of these disciplines. Personally, as an osteopathic physician, I think the responsibility of diagnosis and assessment of malalignment, at least preliminarily, should absolutely rest with the physician. This is especially important as malalignment should be the first aspect of treatment addressed in a patient’s care, and if it is missed it is very likely to persist and injuries will continue to recur.
7. In general, I would say a gait analysis is not likely to be a necessary part of an evaluation for a patient with malalignment. A lot of useful information can be gained from a thorough and effective physical exam. I would say currently a gait analysis could help add confirmatory information although would be unlikely to change the overall management of malalignment significantly. The research and availability of gait analysis continues to grow, and in the future may have a larger role to play.
8. They should avoid running on roads (because of camber, not necessarily because they are harder surfaces). If they have to, tell them they should regularly switch which side of the road they run on. They should be warned to be careful of cars when running on the right hand side of the road however and to weigh the risks/benefits/comfort level. I would strongly recommend for most runners to wear shoes that have a zero heel to toe drop (don’t have a heel) and that have a wide-toe box. Altra and Topo-athletic are currently the only two shoe companies that make cushioned shoes with these attributes. I would also recommend runners try some of their running in minimalist models. Minimalist shoes ideally are zero-drop, have a wide-toe box, and have a thin, flexible sole with no to minimal cushioning or support. Merrell Vapor glove and Vibram Fivefingers are two good examples. Runners should be informed that pronation/supination control and shoe type based on arch height are not strongly supported by research, I would go as far to say they are invalidated as far as being important factors in determining appropriate shoe type (that is, probably won’t get the best advice on shoes from the people at the running shoe stores). As long as a shoe meets the above characteristics, current evidence suggests shoe choice should largely be dictated by fit and feel for the vast majority of runners.