



WHAT IS THE OPTIMAL SYRINGE PLUNGER TECHNIQUE AND SYRINGE SIZE TO OPTIMIZE THE RECOVERY OF MARROW DURING ASPIRATION?

Gronkjaer et al researched the question of whether a gentle pull of the syringe plunger or a rapid jerk of the plunger, creating a rapid negative pressure inside the syringe, made a difference in the recovery of cells. They determined that a rapid jerk-like motion of the plunger resulted in twice the number of cells compared to gently pulling the plunger. Intuitively this makes sense given the difference in viscosity between blood and marrow. A gentle pull allows the lower viscous blood to begin to flow leaving the higher viscous marrow in tact in the marrow. A rapid jerk of the plunger creates a larger pressure differential at the lumen openings of the needle inside the marrow space. This rapid pressure change does not give the blood a chance to seep into the needle ahead of the marrow.

Therefore, with the Marrow Cellution™ system, the approximate 1mL fill should be accomplished by rapidly jerking back the plunger. Each 1 mL fill is accomplished at each new location after turning the handle 360 degrees counter clockwise as the aspiration cannula is removed from the body using the screw set. The plunger should be let go after each additional 1 mL fill. This will cause the pressure inside the syringe to normalize and therefore the plunger will automatically position itself at the fill line, which should be about 1 mL higher than the previous fill line.

Hernigou et al researched whether a larger syringe that creates a greater pressure differential will result in greater cells per mL. For varying volumes of aspirate, they compared a 10mL syringe to a 50mL syringe. They concluded that the optimal syringe size was 10mL combined with a rapid pull of the plunger optimizing the negative pressure. Their rationale for the results was that the resistance of pulling back the 10mL syringe was so much less than the larger syringe. Therefore, the user was able to create a more rapid change in pressure using the 10 mL syringe even though the larger 50 mL syringe was ultimately able to create a greater overall vacuum. Once the less viscous peripheral blood begins to flow, the higher vacuum of the 50 mL syringe worked at cross-purposes to capturing higher viscous marrow cells. They also reported, regardless of syringe size, that greater volumes of marrow from any one location resulted in fewer cells per mL due to infiltrating peripheral blood. Therefore, the optimal technique is to use a 10mL syringe with a rapid plunger motion and with a 1 mL draw from each location.

Therefore, with the Marrow Cellution™ system, we provide a 10 mL syringe and at each aspiration site, we teach to fill 1 mL to no more than 2 mL by pulling plunger back to maximum vacuum; release the plunger, move the needle and repeat the process until the needle has been unwound from the body.

Acta Haematologica , October 2016 135:81-87 Bone Marrow Aspiration: A Randomized Controlled Trial Accessing the Quality of Bone Marrow Specimens Using Slow and Rapid Aspiration Techniques and Evaluating Pain Intensity Gronkjaer et al Int Orthop 2013 Nov;37 (11): 2279-87 Benefits of small volume and small syringe for bone marrow aspirations of mesenchymal stem cells Hernigou. P et al