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Implications for Scarring and Tattoos with LAIs

When considering an aqueous versus oil-based LAI, the following considerations should be reviewed:

- Aqueous solutions are fully dissolved in water and relies on rapid passive diffusion across capillary membranes
- Oil-based solutions act as slow-release depots as the medication must partition from the oil into the surrounding interstitial fluid before reaching the systematic circulation; frequently restricted to intramuscular (IM) administration as subcutaneous (SQ) injection into the fat layer can cause significant pain, sterile abscesses, or lipoatrophy

Scar tissue is generally considered a relative contraindication for IM and SQ injection sites.

Tattoos are not a contraindication for standard injections, though some practical considerations apply.

Scarring

Scar tissue, particularly deep or hypertrophic scars, may extend through the subcutaneous layer into the underlying muscle, and the depth and extent of fibrosis cannot be reliably assessed by surface inspection alone.

Key Concerns

Altered drug absorption

Scar tissue has reduced vascularity and altered tissue architecture, which can impair or unpredictably alter drug absorption from both intramuscular (IM) and subcutaneous (SQ) sites.

Increased pain and difficulty

Dense, fibrotic scar tissue can make needle insertion more difficult and painful and may prevent proper deposition of medication at the intended tissue depth.

Reduced bioavailability

Medications deposited in poorly perfused fibrotic tissue may have delayed or diminished absorption. This is particularly relevant for LAI antipsychotics where consistent pharmacokinetics are critical.

Keloid or hypertrophic scars

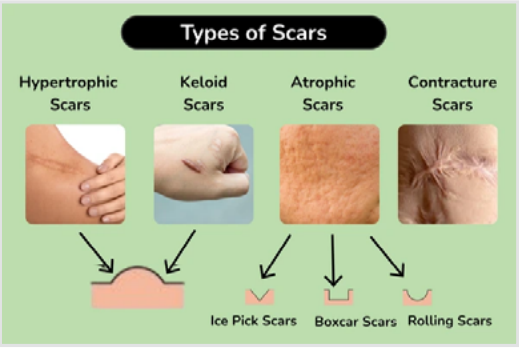
These warrant avoidance, as injection trauma can trigger further keloid formation in susceptible individuals.

Standard of care

For SQ injections, the accepted standard is to administer outside a 50-mm (5 cm) radius from any scar, broken skin lesion, bruise, or the umbilicus.

When scar tissue is present at the intended injection location, IM injection guidelines recommend avoiding scarred or damaged tissue entirely and selecting an alternative anatomical site.

Ethnicities with higher melanin levels, particularly those of African, Asian, and Hispanic descent, possess a heightened genetic predisposition to developing keloids and hypertonic scars. Site rotation is critical in these populations to prevent localized micro-trauma, inflammation, and the subsequent overproduction of collagen.



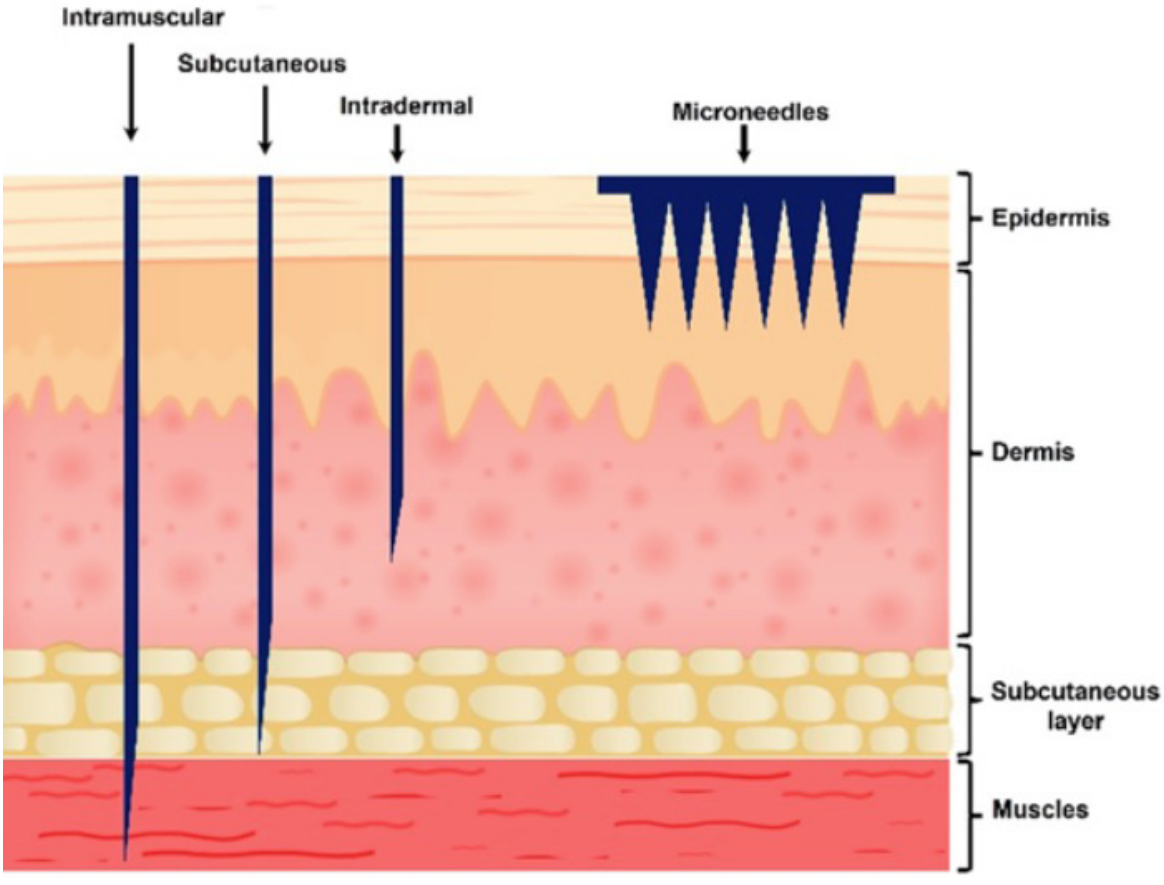
Tattoos

The implications of injecting through tattoos are more nuanced. Tattoo ink resides in the dermis while IM injections target the muscle fascia. SQ injections target the subcutaneous fat layer, which as illustrated, are both deeper than the tattoo pigment.

When tattoo ink is injected into the skin, macrophages will accumulate in this area and engulf the pigment particles. As the ink particles are too large to break down, the macrophages will trap the pigment. When the macrophage dies, the ink is released into the tissue, to be taken up by another macrophage. This ongoing biological conflict maintains an immune system in a continuous state of low-level, local inflammation. Additionally, overtime tiny particles of ink will travel through the lymphatic system and accumulate in the draining lymph nodes. Due to these changes in the local and systemic immune system, injecting anything else directly into or near a tattoo can produce altered responses.

While not a formal contraindication, there are some considerations that include:

- Neither the CDC/ACIP guidelines nor major injection technique references list tattoos as a contraindication to IM or SQ injection.
- Tattoo ink is deposited in the dermis, while IM injections traverse the dermis and subcutaneous tissue to reach muscle.
- SQ injections target the subcutaneous layer which are both deeper than the tattoo pigment layer.
- Actively inflamed or reactive tattoos (e.g., with granulomatous or allergic reactions) should be avoided as injection sites, similar to any area of active skin pathology.
- Other concerns with tattooed skin include impaired thermoregulation which can elevate surface temperatures, obscured visualization, which may mask early indicators of injection site reactions.



Key Takeaways

First choice

Use an unaffected, unscarred, untattooed site with adequate muscle mass and proper anatomical landmarks.

If scarring is present

Relocate to an alternative site (e.g., ventrogluteal instead of deltoid). If all standard sites have some scarring, choose the area with the least fibrosis and best tissue quality.

If tattoos cover the injection site

Proceed with injection if no alternative site is available, ensuring proper skin antisepsis and landmark identification. Avoid areas with active tattoo reactions.

For patients who have extensive tattoos and scarring

Consider using the ventrogluteal site, which is recommended as the preferred IM site due to its large muscle mass, minimal subcutaneous fat, and distance from major nerves and vessels.

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