



CCSU
SPORTS MEDICINE
SYMPOSIUM 2023



DISCLAIMER

- NO CONFLICT OF INTEREST
- NO RELEVANT FINANCIAL OR NON-FINANCIAL RELATIONSHIP
- NO OFF-LABEL USE OF MEDICATION/DEVICE

INTEGUMENTARY SYSTEM

WOUND ASSESSMENT

CLOSURE TECHNIQUES

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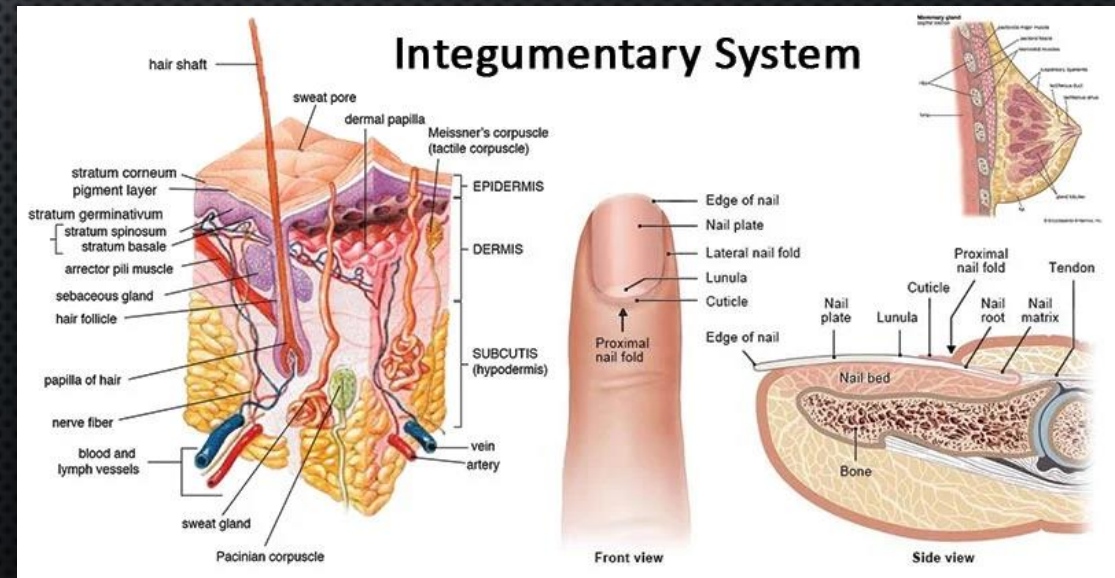
LEARNING OBJECTIVES

- INCREASE UNDERSTANDING OF COMPLEXITIES OF INTEGUMENTARY SYSTEM
- IMPROVE ABILITY TO EVALUATE, ASSESS & MANAGE WOUND INJURIES
 - STERILE FIELD, DEBRIDEMENT, PREPARATION
 - ANESTHETIC PREPARATION & ADMINISTRATION
- HONE SKILLSET OF SUTURING TECHNIQUES
 - MATERIALS, INSTRUMENTS, “SIMPLE” SUTURE

THE SKIN

A UNIQUE SYSTEM

- “ORGAN”
 - THE INTEGUMENTARY SYSTEM INCLUDES THE EPIDERMIS, DERMIS, HYPODERMIS, ASSOCIATED GLANDS, HAIR, AND NAILS. IN ADDITION TO ITS BARRIER FUNCTION, THIS SYSTEM PERFORMS MANY INTRICATE FUNCTIONS SUCH AS BODY TEMPERATURE REGULATION, CELL FLUID MAINTENANCE, SYNTHESIS OF VITAMIN D, AND DETECTION OF STIMULI



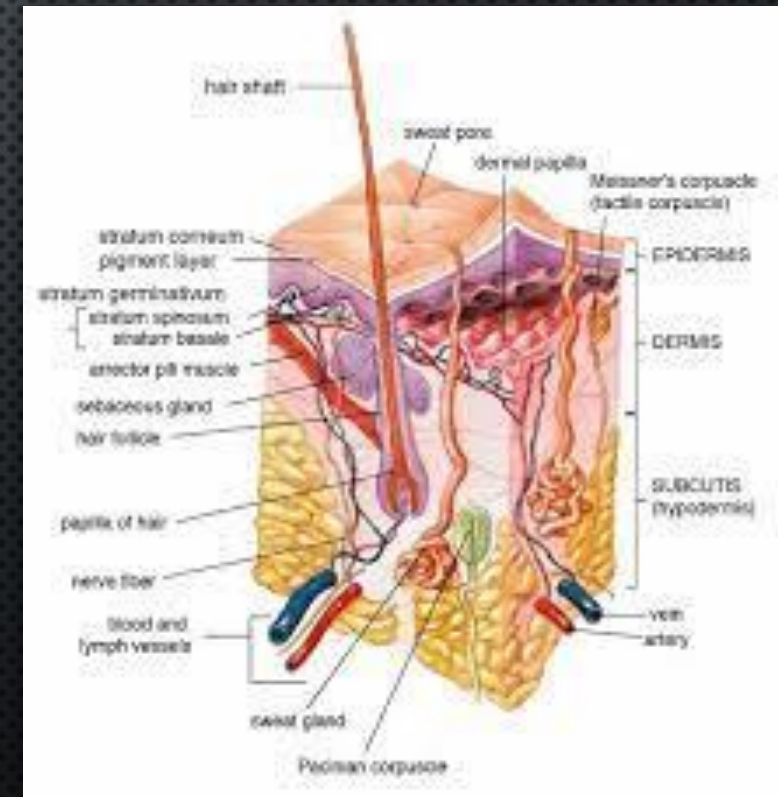
INJURY

VIOLATION OF “BARRIER”

- CONTUSION
 - BLUNT FORCE
 - DIRECT BLOW
 - STRETCH/COMPRESSION/TWIST
- LACERATION
 - CUT
 - TEAR
 - DEGLOVE/SLOUGH
- TRAUMA = DISRUPTION
 - “OPENS THE DOOR”
 - VULNERABLE TO ALTERED EXPOSURE
 - PROTECTION
 - SENSATION
 - INFECTION

ANATOMY

- COMPLEX
 - LAYERS:
 - EPIDERMIS
 - DERMIS
 - SUBDERMIS (HYPODERMIS)



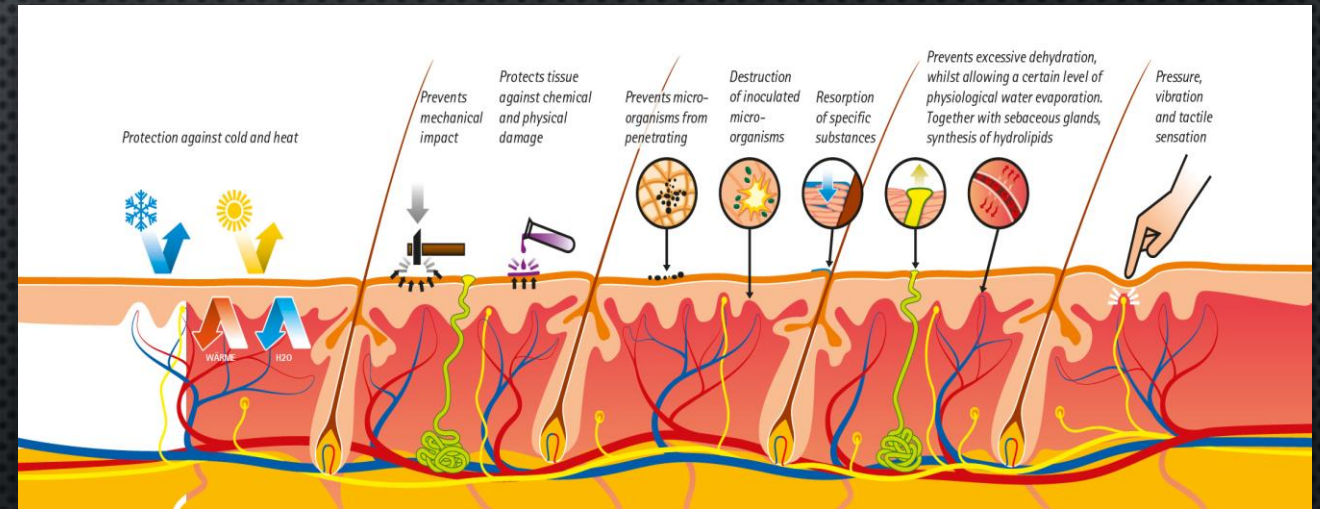
PHYSIOLOGY

- WITHIN EACH LAYER RESIDE UNIQUE GLANDS/STRUCTURES/ELEMENTS THAT COORDINATE FUNCTIONAL INTEGRITY OF AN ORGANIZED SYSTEM
- DISRUPTION OF THE SYSTEM ALTERS ABILITY TO PERFORM SPECIFIC FUNCTION



FUNCTION & FACTS

- LARGEST ORGAN IN THE BODY
- HOMEOSTASIS & PROTECTION OF INTERNAL ORGANS
- TEMPERATURE REGULATION
- CUTANEOUS SENSATION
- ABSORPTION, EXCRETION
- METABOLIC (VIT D PRODUCTION)



BARISTA

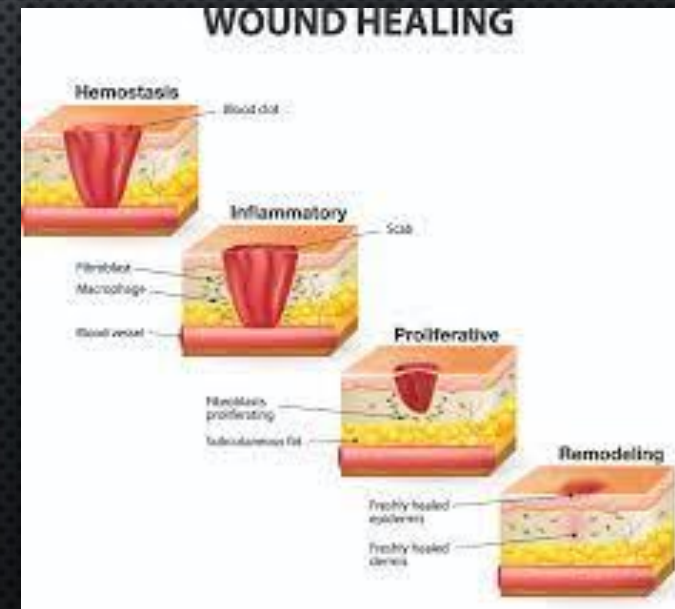
- SKIN COVERAGE = $2 m^2$ (AVERAGE)
- 15% BODY WEIGHT
- WEIGHS 9LBS
- 11 MILES OF BLOOD VESSELS
- RENEWS ITSELF EVERY 28 DAYS



INJURY

STIMULATES PROGRAMMED RESPONSE

- HEMOSTASIS
- INFLAMMATION
- PROLIFERATION
 - GRANULATION & CONTRACTION
- REMODELING
 - MATURATION



HEALING PROGRESSION

PHASE

CELLULAR AND BIO-PHYSIOLOGIC EVENTS

HEMOSTASIS

1. VASCULAR CONSTRICTION
2. PLATELET AGGREGATION, DEGRANULATION, AND FIBRIN FORMATION (THROMBUS)

INFLAMMATION

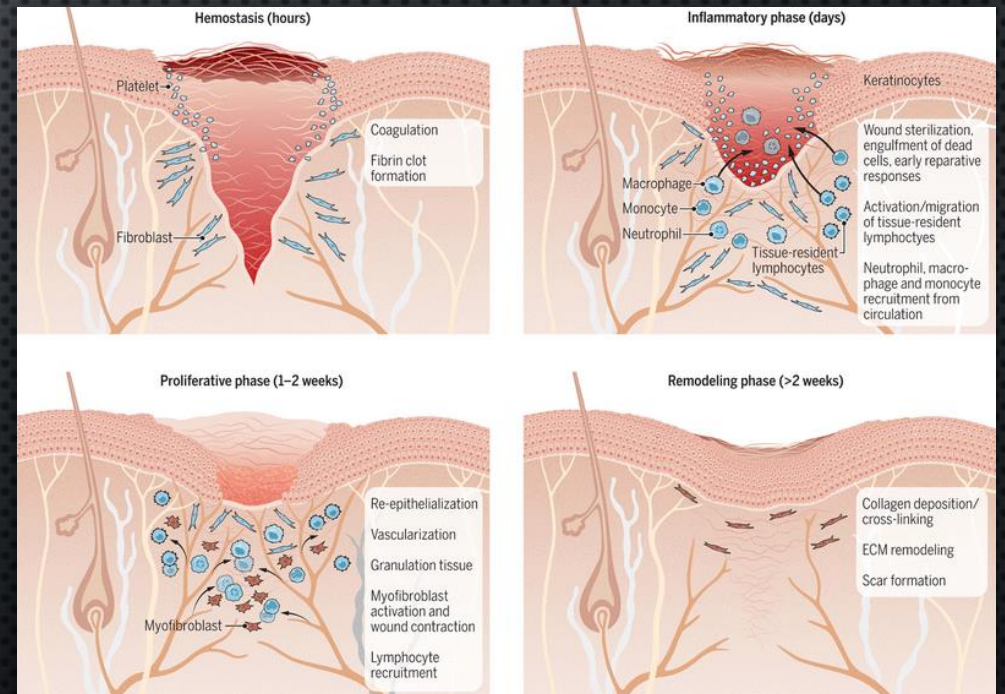
1. NEUTROPHIL INFILTRATION
2. MONOCYTE INFILTRATION AND DIFFERENTIATION TO MACROPHAGE
3. LYMPHOCYTE INFILTRATION

PROLIFERATION

1. RE-EPITHELIALIZATION
2. ANGIOGENESIS
3. COLLAGEN SYNTHESIS
4. ECM FORMATION

REMODELING

1. COLLAGEN REMODELING
2. VASCULAR MATURATION AND REGRESSION



BARRIERS TO HEALING

LOCAL

- ENVIRONMENT
 - UNIFORM
 - EQUIPMENT
 - TAPE, BRACE, DEVICE
 - DIRT, GRASS, ARTIFICIAL TURF RUBBER PELLETS/CORK

SYSTEMIC

- PHYSIOLOGIC HEALTH & INTEGRITY OF INDIVIDUAL
 - AGE
 - CO-MORBIDITIES
 - DM, HTN, CARDIAC, OBESITY, SMOKER, ETOH
 - MEDICATIONS

BARRIERS

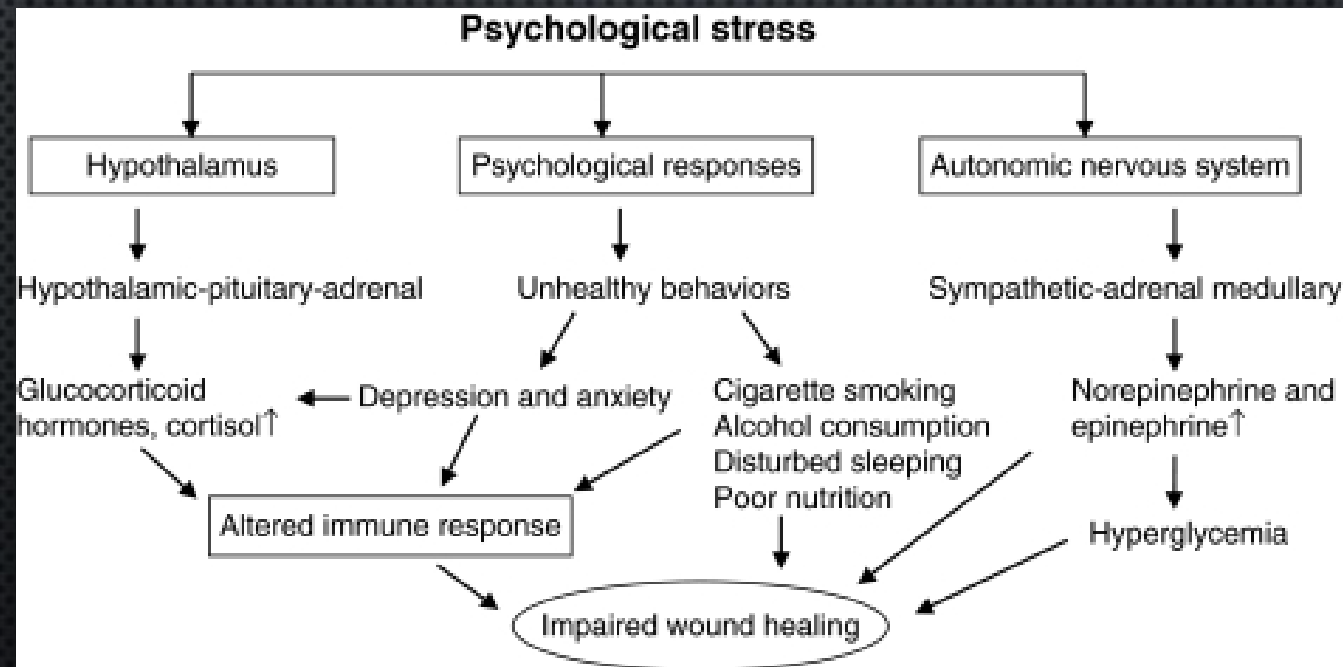
LOCAL FACTORS

- OXYGENATION
- BODY
- VENOUS SUFFICIENCY
- INFECTION
- FOREIGN OBJECT

SYSTEMIC FACTORS

- AGE AND GENDER
- SEX HORMONES
- STRESS
- ISCHEMIA
- DISEASES: DIABETES, KELOIDS, FIBROSIS, HEREDITARY HEALING DISORDERS, JAUNDICE, UREMIA
- OBESITY
- MEDICATIONS: GLUCOCORTICOID STEROIDS, NON-STEROIDAL ANTI-INFLAMMATORY DRUGS, CHEMOTHERAPY
- ALCOHOLISM AND SMOKING
- IMMUNOCOMPROMISED CONDITIONS: CANCER, RADIATION THERAPY, AIDS
- NUTRITION

BARRIERS



WOUND EVALUATION

INITIAL

- *GLOVES !!!*
- EXPOSE & ISOLATE
- DIRECT FIRM PRESSURE
- XEROFORM/ADAPTIC NON-STICK COVER
- BULKY SOFT DRESSING
 - GAUZE PADS
 - COBAND/ACE WRAP (LOOSELY) ACTS AS TAMPONADE
- TOURNIQUET ???

DELAYED

- *GLOVES !!!*
- EXPOSE & ISOLATE
- IF “BANDAGED” UNWRAP AND EVALUATE
 - WARM H₂O/SOAK TO RELEASE ADHESIONS/ESCHAR
 - SOAK IF NECESSARY
- XEROFORM/ADAPTIC NON-STICK COVER
- RE-DRESS

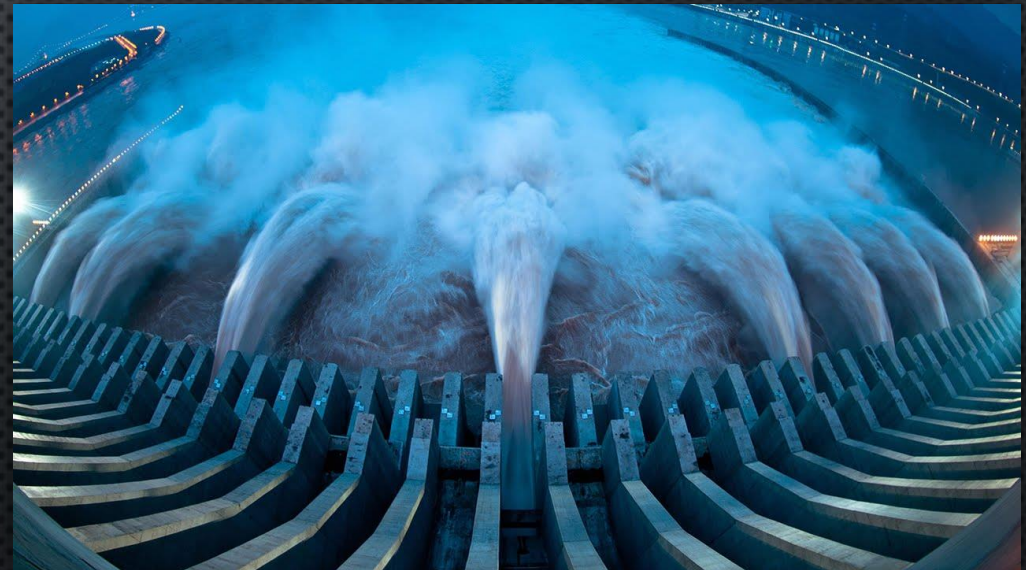
“PREP & DRAPE”

- ISOLATE THE FIELD
- MAINTAIN STERILE BARRIER
- ALLOW AMPLE WORK SPACE
- SET UP REQUIRED MATERIAL
- “THIRD HAND” ASSISTANT



WOUND CLEANING

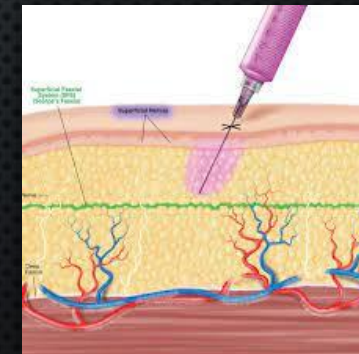
- WASH (SALINE FLUSH)
- REMOVE CONTAMINANTS/DEBRIS WITH MOIST GAUZE PAD
- “GENTLE” SCRUB
- SYRINGE SPRAY IRRIGATION
- DEBRIDE/ELEVATE FLAPS & DEVITALIZED TISSUE



“THE SOLUTION TO POLLUTION IS DILUTION”

LOCAL ANESTHETIC

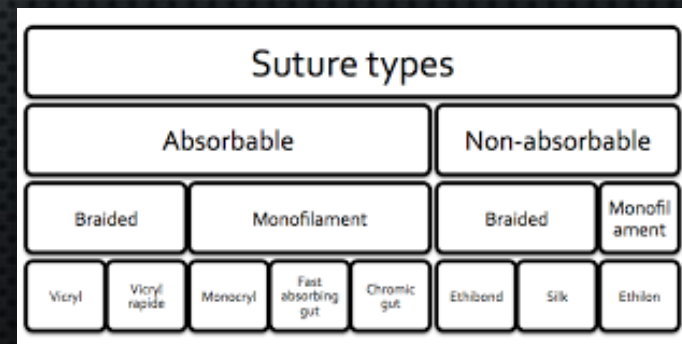
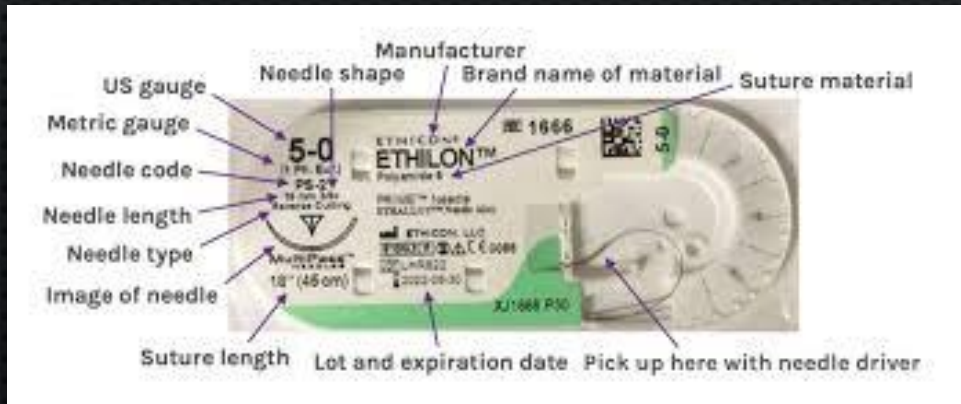
- INFILTRATE CUTANEOUS NERVES WITH LOCAL ANESTHETIC
- “FIELD BLOCK” DERMAL/SUBDERMAL LAYER WITH SEVERAL CC’S OF LIDOCAINE
- 5CC SYRINGE W/ 25 GAUGE NEEDLE



SUTURES

- WHAT

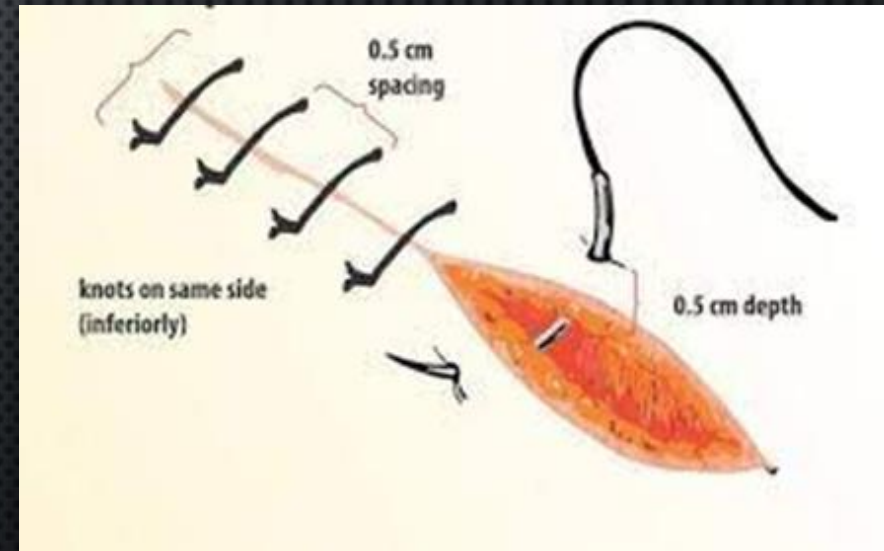
- TYPES & SIZES



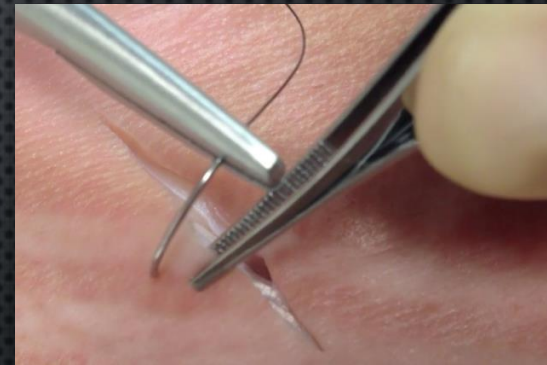
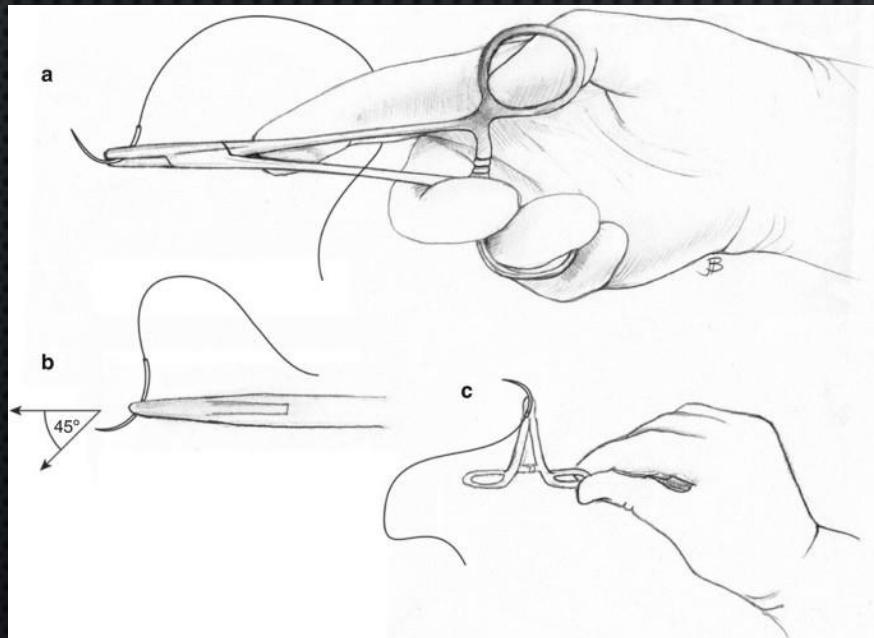
Thread Sizes	Uses
0-0	Extraocular muscle isolation
1-0	Stay Sutures
2-0	Deep tissue, fascia, high tension
3-0	Deep tissue, fascia
4-0	Skin, deep tissue
5-0	Brow, facial skin, levator
6-0	Muscle, eyelid skin, traction
7-0	Muscle, conjunctiva, eyelid skin
8-0	Sclera
9-0	Limbus, conjunctiva
10-0	Cornea
11-0	Cornea, nerve sheath

SUTURE TECHNIQUE

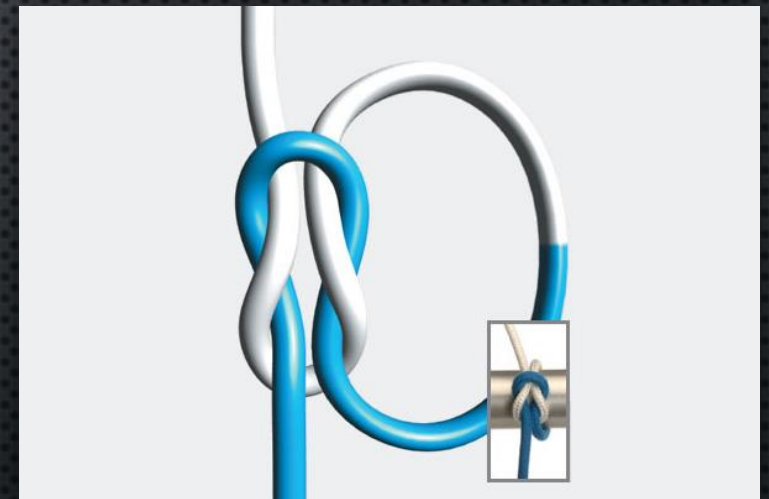
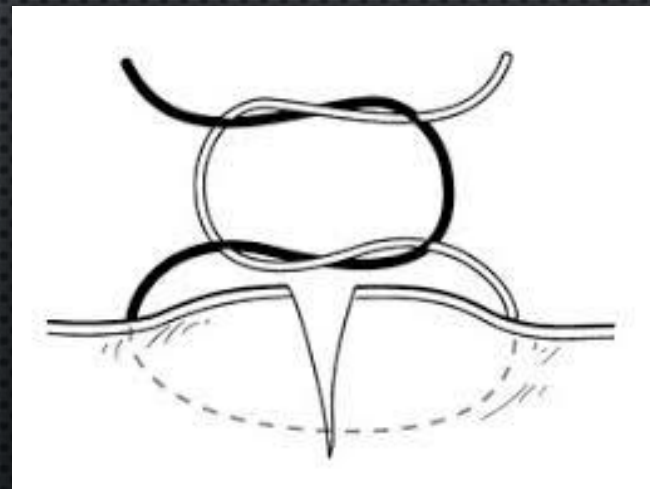
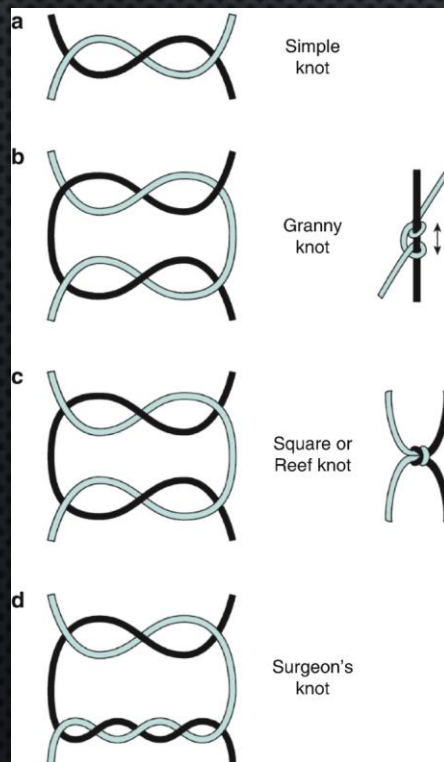
- “SIMPLE” STITCH
 - ALIGN SKIN EDGES
 - PIERCE SKIN 2-3MM AWAY FROM EDGE
 - PASS NEEDLE THRU DERMAL/SUBQ
 - PASS THRU OPPOSING DERMAL/SUBQ
 - EXIT 2-3MM OPPOSITE SIDE
 - TIE SQUARE KNOT 4-5 THROWS
 - “SLIDE” KNOT TO A SIDE
 - CUT SUTURE LEAVING 2-3MM TAILS



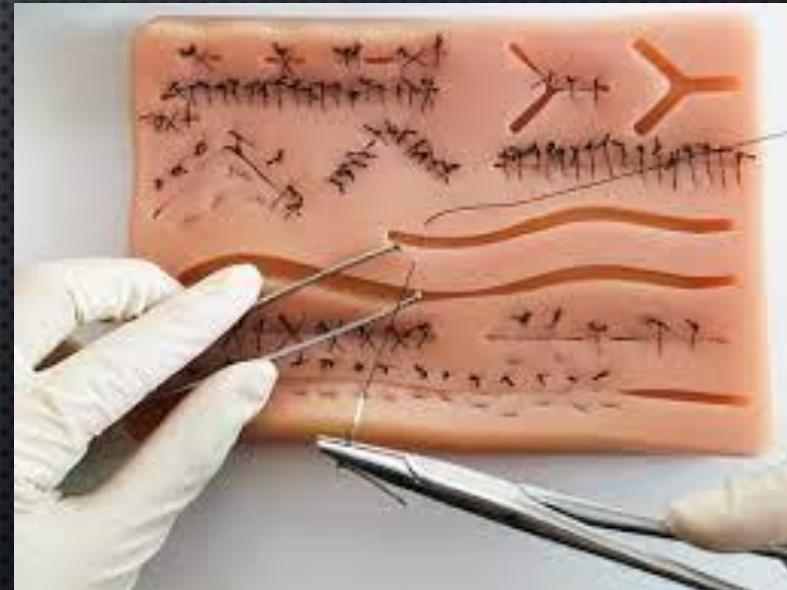
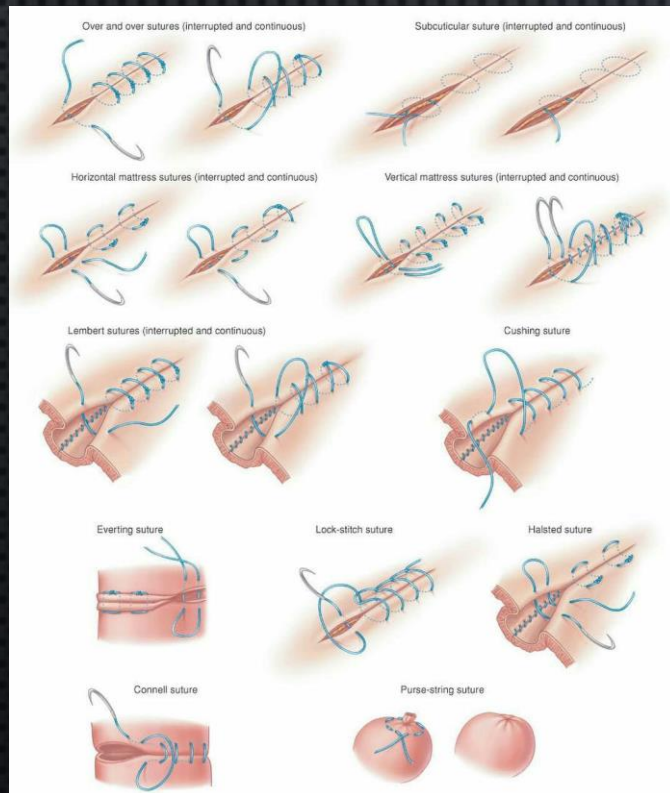
HAND POSITION



SUTURE TECHNIQUE: KNOTS

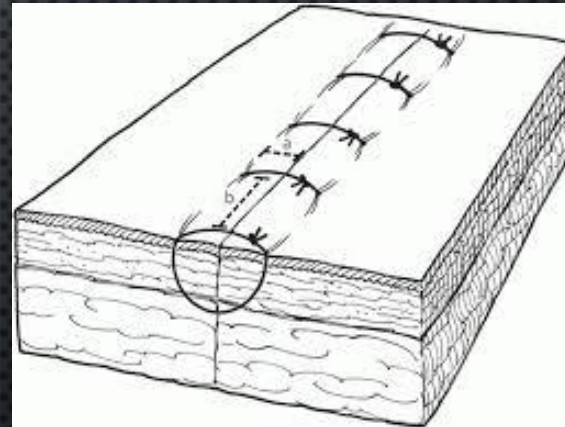


SUTURE TECHNIQUE: TYPES



SUTURE TECHNIQUE

- PEARLS
 - DON'T BURY THE KNOT
 - EVERT SKIN EDGES
 - DON'T OVERTIGHTEN KNOT
 - NECROSIS OF SKIN
 - USE SKIN LANDMARKS TO LINE UP EDGES
 - LANGERS LINES
 - TATTOOS



SPECIAL CIRCUMSTANCES

- **PUNCTURE WOUND**

- PENETRATION & EXTENSION INTO DEEP PLANES

- SMALL ENTRY SITE
- DEPTH OF INOCULATION
- EXPANSILE
- ENTRAPMENT

- TREATMENT: IRRIGATION & DEBRIDEMENT

- IN DIRECTION OF PUNCTURE WOUND
- CARE NOT TO CONTAMINATE SURROUNDING TISSUE PLANES
- DEBRIDEMENT OF DEVITALIZED TISSUE (**NB** NOT ROUTINE FOR PUNCTURE WOUNDS)
- TETANUS IG & TOXOID
- CONTAMINATED WOUNDS NOT PRIMARILY CLOSED; HEAL BY DELAYED/SECONDARY HEALING (ALLOWED TO DRAIN THROUGH STERILE DRESSING)

SPECIAL CIRCUMSTANCES

- **HUMAN BITE**
 - OCCLUSION BITE OR CLOSE FIST BITE
 - “FIGHT BITE”
 - CONTAMINANTS:
 - *STREPTOCOCCUS*
 - *STAPHYLOCOCCUS*
 - *EIKENELLA*
- FIRST PARENTAL DOSE, AMPICILLIN—SULBACTAM (3 G) OR CEFOXITIN (1 G) OR ERTAPENAM (1 G) FOLLOWED BY AMOXICILLIN—CLAVULANATE (875/ 125 MG PO Q 12 H) FOR 3-5 DA
- FIRST PARENTAL DOSE OF CLINDAMYCIN (600 MG) FOLLOWED BY CLINDAMYCIN (300 MG PO Q 8 H) PLUS A FLUOROQUINOLONE (CIPROFLOXACIN, 500 MG PO Q 12 H, OR LEVOFLOXACIN, 750 MG/D PO, OR MOXIFLOXACIN, 400 MG/D PO) FOR 3-5 DAY
- IF PARENTAL THERAPY CANNOT BE GIVEN, APPROPRIATE ORAL ANTIBIOTICS (E.G., AMOXICILLIN—CLAVULANATE, 875/ 125 MG PO Q 12H) FOR 3-5 DAYS

SPECIAL CIRCUMSTANCES

- **ANIMAL BITE**

- DOG
- CAT

- CANINE/INCISOR TOOTH

- SHARP, LONG, POINTED
 - DEPTH OF PENETRATION IN PUNCTURE
 - DEEP INOCULATION AND “BURIED”

- PATHOGEN:

- *PASTEURELLA CANUS*
- *PASTEURELLA MULTOCIDA*
- RABIES STATUS

- RX:

- AMOXICILLIN/CLAVULANIC ACID
- CEFUROXIME/CEFTRIAZONE

SPECIAL CIRCUMSTANCES



“THE VOICE OF REASON”

- THERE ARE SOME LACERATIONS THAT REQUIRE URGENT EVALUATION IN THE APPROPRIATE SETTING
- PACKAGE & SHIP



HAPPY SUTURING



REFERENCES

J EMERG TRAUMA SHOCK. 2009 SEP-DEC; 2(3): 186–190.
MANAGING HUMAN BITES
PRADNYA D PATIL, TANMAY S PANCHABHAI,¹ AND SAGAR C
GALWANKAR²

PHYSIOLOGY, INTEGUMENT; JOYCE Y. KIM; HARRY DAO, UNIVERSITY OF CALIFORNIA RIVERSIDE SCHOOL OF
MEDICINE, LOMA LINDA UNIVERSITY, MAY 8, 2022.

FACTORS AFFECTING WOUND HEALING
S. GUO AND L.A. DIPIETRO*

HUMAN BITES
KENNETH MANISCALCO; MARY ANN EDENS.
LAST UPDATE: JULY 18, 2022.

REFERENCES

CLIN MICROBIOL REV. 2011 APR; 24(2): 231–246. MICROBIOLOGY OF ANIMAL BITE WOUND INFECTIONS

FREDRICK M. ABRAHAMIAN^{1,2,*} AND ELLIE J. C. GOLDSTEIN^{1,3,*}

SURGERY (OXFORD)

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BASIC SCIENCE

PHYSIOLOGY OF THE SKIN

GERARD MCKNIGHT, JASMINE SHAH, RACHEL HARGEST