

INFECTIONS OF THE HAND

A GUIDE TO
THE SURGICAL TREATMENT OF
ACUTE AND CHRONIC
SUPPURATIVE PROCESSES
IN THE FINGERS, HAND AND FOREARM

By ALLEN B. KANAVEL, M.D., Sc.D.

*Late Professor of Surgery, Northwestern University Medical School, Chicago;
Attending Surgeon, Wesley Memorial and Passavant Memorial
Hospitals, Chicago*

Seventh Edition, Thoroughly Revised

ILLUSTRATED WITH 229 ENGRAVINGS, MANY IN COLOR



LEA & FEBIGER
PHILADELPHIA

CONTENTS.

CHAPTER I.

INTRODUCTION.

History	17
Scope and Classification of Types of Infection	19

PART I.

THE ANATOMY OF THE HAND, WITH PARTICULAR REFERENCE TO INFECTION.

CHAPTER II.

METHODS OF STUDY IN GENERAL: STUDY OF SERIAL CROSS-SECTIONS OF THE HAND, WITH PARTICULAR REFERENCE TO THE FASCIAL SPACES.

Methods of Study	24
The Fascial Spaces of the Hand	27
The Relations of the Middle Palmar and Thenar Spaces . .	35
Résumé	37

CHAPTER III.

THE TENDON SHEATHS: A DISCUSSION OF THEIR ANA- TOMICAL DISTRIBUTION AND RELATIONS, WITH SURGICAL DEDUCTIONS.

Sheaths Upon the Flexor Surface	39
The Sheaths of the Index, Middle and Ring Fingers	40
The Tendon Sheaths of the Flexor Pollicis Longus and the Radial Bursa	41
The Tendon Sheath of the Little Finger and the Ulnar Bursa	43
The Intercommunication of the Sheaths	45
The Sheaths Upon the Dorsum	49

CHAPTER IV.

THE RELATION BETWEEN THE SYNOVIAL SHEATHS AND THE MAJOR FASCIAL SPACES. A STUDY OF EXPERIMENTAL INJECTION OF THE OUTLINES, BOUNDARIES, AND DIVERTICULA OF THE MAJOR FASCIAL SPACES AND THE RELATIONS OF THESE TO THE SYNOVIAL SHEATHS.

The Relation of Tendon Sheath Rupture to the Major Fascial Spaces	52
Injection via the Tendon Sheath of the Middle Finger	52
Injection via the Tendon Sheath of the Ring Finger	53
Injection of the Tendon Sheath of the Little Finger	55
Injection of the Tendon Sheath of the Index Finger	59
Injection of the Tendon Sheath of the Flexor Pollicis Longus	60
Summary of Relations of Tendon Sheaths to Major Fascial Spaces	61
The Normal Boundaries of the Major Fascial Spaces and the Position of Secondary Abscesses in Cases of Extension From These Spaces	62
The Middle Palmar Space	62
Injection of the Tendon Sheath of the Ring Finger	62
Injection Through the Palmar Fascia into the Middle Palmar Space	63
Injection Along Lumbrical Muscle of Ring Finger	67
The Thenar Space	68
Injection of the Tendon Sheaths of the Index Finger	68
Forceful Injection of the Thenar Space	70
Injection of the Thenar Space Through Palmar Fascia	73
The Dorsal Subcutaneous Space	74
Injection of Subcutaneous Tissue of the Dorsum Between the First and Second Metacarpals	74
Injection of the Subcutaneous Tissue of the Dorsum Between the Second and Third Metacarpal Bones	75
The Dorsal Subaponeurotic Space	75
Injection Under Tendons of Dorsum	75
The Hypothenar Space	77
Résumé of Experiments to Demonstrate Boundaries and Diverticula of the Major Fascial Spaces	77

CHAPTER V.

ANATOMY OF THE FOREARM IN RELATION TO INFECTIONS. THE MAJOR SPACE.

Anatomy in General	82
Serial Cross-sections of the Forearm	83
Experimental Injections of the Fascial Spaces of the Forearm	87
Injection of the Radial Bursa	88
Injection of the Ulnar Bursa	89
Injection from the Middle Palmar Space	89
Résumé—The Major Forearm Space	92

CHAPTER VI.

ANATOMY OF THE LYMPHATICS.

Superficial Lymphatics	93
Deep Lymphatics	101

CHAPTER VII.

FUNCTION OF THE HAND IN RELATION TO INFECTIONS	104
The Position of Function	111

CHAPTER VIII.

GENERAL PRINCIPLES OF TREATMENT.

Incisions for Drainage	113
Drainage	114
Asepsis in Subsequent Dressings	115
Rest	116
Increasing the Patient's Resistance	116
Drugs	116
Passive Hyperemia	116
Hot Moist Dressings and Allied Applications	117
Bacteriophage	119
Stimulation of Excretions	120
Nutrition	120
Dehydration of the Hand	121
Exposure of the Whole Body to Sunlight or Ultra-violet and Roentgen Rays	121
Blood Transfusion	122
Placing the Hand in the "Position of Function"	122
Delayed Recovery	122
Physical Therapy	123

CHAPTER IX.

PROPHYLACTIC TREATMENT OF INJURIES. A CONSIDERATION OF THE METHODS OF PREVENTING INFEC-	124
TION AFTER ACCIDENTS, AND THE PROPHYLACTIC	
CARE OF EMPLOYÉS IN INDUSTRY	124
The Relation of Infection to Accidents in Industry	130
Prevention of Hand Infections in Industry	133
Active Treatment of Hand Infections Among Employés	135
Conclusions	138

PART II.

LOCALIZED INFECTIONS AND CLINICAL ENTITIES EXCLUSIVE OF LYMPHANGITIS, MAJOR FASCIAL SPACE AND TENDON SHEATH INFECTIONS.

CHAPTER X.

INFECTIONS OF THE DISTAL PHALANGES.

Felons	139
Paronychia	148
Occupational Paronychia	152

CHAPTER XI.

CUTANEOUS AND SUBCUTANEOUS INFECTIONS. CAR- BUNCLES, SUBEPITHELIAL ABSCESSSES, ERYSIPELOID, INDELIBLE PENCIL INJURIES, ACUTE AND CHRONIC INFECTIONS, BLASTOMYCOSIS.

Carbuncles	154
Subepithelial Abscesses	163
Erysipeloid	163
Indelible Pencil Injuries	165
Chronic Cutaneous and Subcutaneous Infections	167
Localized Chronic Infections	167
Non-healing Due to Excessive Mobility	169
Milker's Nodules (Cattle Hair Infections)	173
Mycotic and Toxic Inflammation	174

Differential Diagnosis	176
Chancere	176
Tularemia, Sporotrichosis and Coccidioidal Granuloma	176
Tularemia	176
Sporotrichosis	178
Coccidioidal Granuloma	178
Blastomycosis, Actinomycosis, and Oriental Boil	179
Blastomycosis (Oidiomycosis)	179
Actinomycosis	179
Oriental Boil	180
Anthrax	180

CHAPTER XII.

ABSCESSES IN MINOR SPACES. COLLAR BUTTON ABSCESS (SHIRT STUD ABSCESS) (FROG FELON)	184
Localized Abscess in the Thenar and Hypothenar Spaces	187

CHAPTER XIII.

INFECTIONS ABOUT THE METACARPO-PHALANGEAL JOINT. A STUDY OF THE ROUTES OF EXTENSION OF INFECTION WITH SPECIAL CONSIDERATION OF INJURIES FROM TEETH AND CONTAMINATION OF THE WOUNDS WITH ORGANISM FROM THE MOUTH (BITES).

Mode of Entrance of the Infection	190
Anatomy of the Fascia About the Metacarpo-phalangeal Joint	193
Clinical Study	205
Discussion of Clinical Course	212
Bacteriological Findings	215
Prognosis	216
Treatment	216

CHAPTER XIV.

GANGRENOUS INFECTIONS. STREPTOCOCCIC, SYMBIOTIC AND GAS GANGRENE	221
Localized Gangrene	223
Bite Gangrene	225
Spreading Gangrenous Streptococcal and Symbiotic Infections	225
Gas Gangrene and Malignant Edema	230
Classic Gaseous Gangrene	233
Toxic Gaseous Gangrene	233
Mixed Gaseous Gangrene	233

PART III.

LYMPHANGITIS, MAJOR FASCIAL SPACE AND TENDON SHEATH INFECTIONS.

CHAPTER XV. DIFFERENTIAL DIAGNOSIS.

Lymphangitis	240
Tenosynovitis	241
Major Fascial Space Infections	245
Diagnosis of Extensions from Various Sites	249

CHAPTER XVI. ETIOLOGY, PATHOGENESIS, AND PATHOLOGY OF LYMPHANGITIS.

Predisposing and Active Factors in the Production of Lymphangitis	250
The Influence of the Type of Germ	251
The Influence of the Anatomy on the Course	254
The Pathology of Lymphangitis	257
Résumé	259

CHAPTER XVII.

SYMPTOMS AND SIGNS OF LYMPHANGITIS WITH DISCUSSION OF THE COMPLICATIONS AND PROGNOSIS.

Symptoms and Signs in General	261
Types	262
Type I Simple Acute Lymphangitis	262
Type II Acute Lymphangitis with Minor Local Complications	262
Type III Acute Lymphangitis with Serious Local Complications	262
Type IV Acute Lymphangitis with Systemic Involvement	263
Acute Lymphangitis with Serious Local Complications	263
Phlegmonous Lymphangitis	265
The Frequency of Localization in Lymphatic Infection	265
Acute Lymphangitis with Systemic Involvement	266
Systemic Involvement	267
Postmortem Statistics	269
Thrombophlebitis	269
Prognosis in Lymphatic Infections	270
Résumé	272

CHAPTER XVIII.

THE TREATMENT OF LYMPHATIC INFECTIONS AND THEIR COMPLICATIONS.

Discussion of Various Procedures	274
Local	274
Warm Moist Dressings	274
Rest	275
The Bier Treatment	276
Incisions	277
Systemic Treatment	278
Antagonistic Drugs	278
Food and Fluids	279
Glucose and Blood Transfusion	279
Serum and Vaccine Treatment	279
Supportive Measures	282
The Treatment of the Complications of Lymphangitis	282
Tenosynovitis	282
Subcutaneous Abscesses	282
Periglandular Abscesses	285
Subpectoral Phlegmons	285
Subclavicular and Shoulder Abscesses	286
Systemic Complications	286
Chronic Infections: Repeated Infections	287

CHAPTER XIX.

TENDON SHEATH INFECTIONS AND MAJOR FASCIAL SPACE ABSCESSSES: PATHOGENESIS AND SOURCE OF INVOLVEMENT.

Tendon Sheaths	298
Source of Involvement of the Various Sheaths	300
Extension from One Sheath to Another	302
Source of Involvement of the Important Fascial Spaces in the Hand. General Discussion	304
Extension from the Tendon Sheaths	304
Direct Implantation of the Infection in the Spaces	305
Involvement by Lymphatic Extension	305
Extension from One Fascial Space to Another	307
Summary as to the Source of Involvement of the Major Fascial Spaces	310

CHAPTER XX.

THE SPREAD OF INFECTION FROM ANY GIVEN PRIMARY FOCUS.

The Probable Extensions from Primary Foci in the Digits	313
The Spread of Infection from the Thumb	313
The Spread of Infection from the Index Finger	314
Fascial Space Extension	314
Synovial Sheath Extension	318
The Spread of Infection from the Middle Finger	322
The Spread of Infection from the Ring Finger	325
Infection Spreading from the Little Finger	325
Infections Beginning in the Palm and Dorsum	327
Résumé	328

CHAPTER XXI.

PATHOLOGY OF TENDON SHEATH AND FASCIAL SPACE ABSCESSSES.

The Tendon Sheath Proper	331
The Fascial Space Abscesses	333

CHAPTER XXII.

THE SYMPTOMS, SIGNS AND DIAGNOSIS OF TENOSYNOVITIS AND MAJOR FASCIAL SPACE ABSCESSSES.

The Symptoms, Signs and Diagnosis of Acute Suppurative Tenosynovitis	336
The Symptoms, Signs and Diagnosis of Extensions from Tendon Sheath Infections Beginning in the Little Finger Extension to the Ulnar Bursa	338
Extension to the Radial Bursa	340
Extension to the Forearm	343
Extension to the Lumbrical and Palmar Spaces	343
The Symptoms, Signs and Diagnosis of Extensions from Tendon Sheath Infections Beginning in the Index, Middle and Ring Fingers	344
The Symptoms, Signs and Diagnosis of Extensions from Tendon Sheath Infections Beginning in the Thumb and Radial Bursa	345
	349

The Symptoms, Signs and Diagnosis of Major Fascial Space Abscesses	351
The Middle Palmar and Thenar Spaces	352
The Hypothenar Space	358
Dorsal Abscesses	359
Forearm Involvement from Infections of the Hand	360
Subcutaneous Abscesses	360
Deep Abscesses	361
Tendon Sheath Infection on the Dorsum of the Wrist	364

CHAPTER XXIII.

THE TREATMENT OF ACUTE SUPPURATIVE TENOSYNOVITIS. DISCUSSION OF TECHNIQUE.

Treatment While the Diagnosis Is in Doubt	366
Technique of Treatment After Diagnosis is Made	366
Infection of Tendon Sheaths of Index, Middle and Ring Fingers	368
Infection of the Tendon Sheath of the Little Finger and Ulnar Bursa	372
Technique of Treatment of Infection of the Proximal End of the Bursa in the Forearm and Pus in the Major Forearm Space	375
Infections of the Sheath of the Flexor Pollicis Longus	387
Synovial Sheaths on the Dorsum	391
After-treatment of Suppurative Tenosynovitis	391

CHAPTER XXIV.

THE TREATMENT OF MAJOR FASCIAL SPACE ABSCESSSES.

The Treatment of Combined Involvement of the Middle Palmar and Thenar Spaces	399
The Treatment of Combined Involvement of the Middle Palmar and Subaponeurotic Spaces	404
Treatment of Abscesses in the Thenar Space	406
Technique of Treatment of Abscesses in Subaponeurotic Space	409
After-treatment in Fascial Space Abscess	410

CHAPTER XXV.

RÉSUMÉ OF THE TREATMENT OF ACUTE SUPPURATIVE TENOSYNOVITIS AND MAJOR FASCIAL SPACE ABSCESSSES. PROGNOSIS.

Résumé	411
Prognosis	412

PART IV.

COMPLICATIONS, SEQUELÆ AND AFTER-TREATMENT OF INFECTIONS OF THE HAND.

CHAPTER XXVI.

COMPLICATIONS OF INFECTIONS OF THE HAND.

Involvement of the Hand Proper and the Metacarpals and Carpals	426
Treatment of Cases Involving the Hand Proper	432
Wrist-joint Infection	435
Treatment in Cases Where the Wrist-joint is Involved	436
Forearm Involvement with Secondary Hemorrhage	440
Treatment in Cases of Secondary Hemorrhage	443
Résumé	444

CHAPTER XXVII.

SEQUELÆ OF INFECTIONS OF THE HAND.

Edema Following Infections	445
Ankylosis, Contractures and Loss of Tissue	448

CHAPTER XXVIII.

PHYSICAL THERAPY AFTER INFECTIONS OF THE HAND.

Hydrotherapy and Radiation	456
Massage	457
Electrotherapy	457
Exercise	458
Occupational Therapy	467
Psychotherapy	469

CHAPTER XXIX.

THE USE OF SPLINTS AFTER INFECTIONS OF THE HAND.

Prophylactic Treatment—Position of Function	470
The Application of Spring or Elastic Tension Splints	472

CHAPTER XXX.

OPERATIVE TREATMENT FOR SEQUELÆ OF INFECTIONS	483
--	-----