

# Fasciectomy for treatment of Dupuytren's disease and early complications

This review of 103 cases of hands operated on for treatment of Dupuytren's disease demonstrates the significant increase of postoperative stiffness as related to recurrences and staging of the disease, but not to sex. On the contrary, the frequency of reflex sympathetic dystrophy after fasciectomy is sex related affecting females. The protective effect of guanethidine may be a valuable therapeutic adjunct for female patients. We propose that the disease be staged on the basis of anatomic findings, inasmuch as staging based on degree of contracture alone is insufficient for comparative studies. (J HAND SURG 1990;15A:755-61.)

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Dupuytren's disease, a contracture of the palmar aponeurosis, is a common disorder in the Western Hemisphere. It affects one male in three over 60 years of age.<sup>1</sup> It is especially prevalent in the white race, while seemingly absent among blacks.

As stated by Millesi,<sup>2</sup> a recurrence rate up to 70% suggests that there is a major problem concerning a correct operative indication.<sup>3,4</sup> Furthermore, the manner in which removal of the pathologic fascia influences disease progression is unknown. In addition, it is often difficult to distinguish recurrence from progression. For definitive purposes, recurrence is the reappearance of the disease in the same location as was previously operated. In contrast, progression is the formation of Dupuytren's contracture distal to the original site of operation or in another part of the hand.<sup>1</sup>

This report analyzes the perioperative and postoperative results after surgical treatment of Dupuytren's disease and is intended to clarify several relevant problems. The perioperative and postoperative risks are evaluated in relation to sex, disease stage, and primary or secondary surgery. An homogeneous series of cases will be the basis for consideration of various aspects of

these problems using the large body of information derived from the fully computerized patient chart<sup>5</sup> used in this Center.

## Materials and methods

The study encompasses a homogeneous group of 203 patients seen between June 1, 1987 and April 1, 1988 at our Center for Hand Surgery in St. Gallen, Switzerland (Fig. 1). Indurations of the hand were seen as early as 17 years of age; and in early cases, a very detailed case history was required to rule out epithelioid sarcoma. If the diagnosis was in doubt, a biopsy was done, since a neoplasm can masquerade as Dupuytren's contracture.<sup>6</sup>

**Definitions.** Our staging of the disease is based on localization of pathologic fascia rather than degree of digital flexion deformity.<sup>2,7</sup> The importance of contracture does not necessarily depend on the amount of tissue infiltration; an isolated pathologic thickening can produce a massive flexion deformity, while a diffuse and invasive infiltration may cause only a minimal one. Thus a purely anatomic definition is more appropriate for an objective comparative analysis.

*Zero stage* represents a palmar nodule. *Stage 1* is a pathologic fascial thickening that does not extend beyond the metacarpophalangeal (MP) flexion fold. *Stage 2* is an invasion limited to the first phalanx (that is, it does not extend beyond the proximal interphalangeal (PIP) flexion fold). *Stage 3* is a progression along the second phalanx, but without extending beyond the distal interphalangeal (DIP) flexion joint fold. *Stage 4* is an invasion of the third phalanx with the lesion having moved across the DIP joint.

Of the hands described in this study, 211 (82.4%)

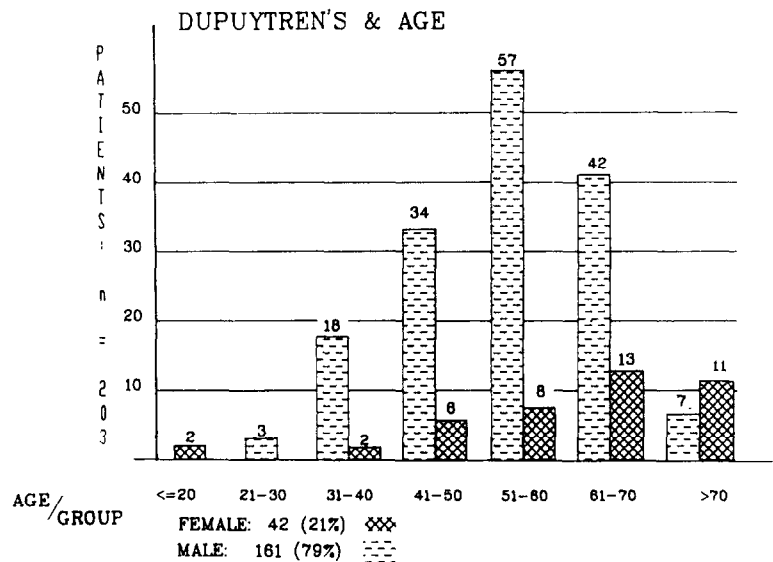
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**Fig. 1.** Two hundred fifty-six hands seen in consultation: operated, 103 (40.2%); not operated, 153 (59.8%).

**Table I.** Topographic distribution of the pathologic aponeurosis, 256 hands, 494 rays

	Ray I 6.3%	Ray II 6.3%	Ray III 18.8%	Ray IV 39.3%	Ray V 29.4%	Total	
						Rays	Hands
Stage 0	0	1	7	13	2	23 (4.7%)	12 (4.7%)
Stage 1	21	18	54	89	42	224 (45.3%)	83 (32.4%)
Stage 2	4	6	23	49	28	110 (22.3%)	54 (21.1%)
Stage 3	4	3	9	43	43	102 (20.6%)	71 (27.7%)
Stage 4	2	3	0	0	30	35 (7.1%)	36 (14.1%)
All	31	31	93	194	145	494 (100%)	256 (100%)

The disease affected 256 hands and 203 patients or 1.26 hand(s)/patient, that is, 494 rays, or 1.9 ray(s)/hand or 2.4 ray (s)/patient.

showed a primary Dupuytren's contracture. Forty-five (17.6%) had a recurrence. Thirty-six hands had a lesion at stage 4, 71 at stage 3, 55 at stage 2, 83 at stage 1, and 12 at stage 0.

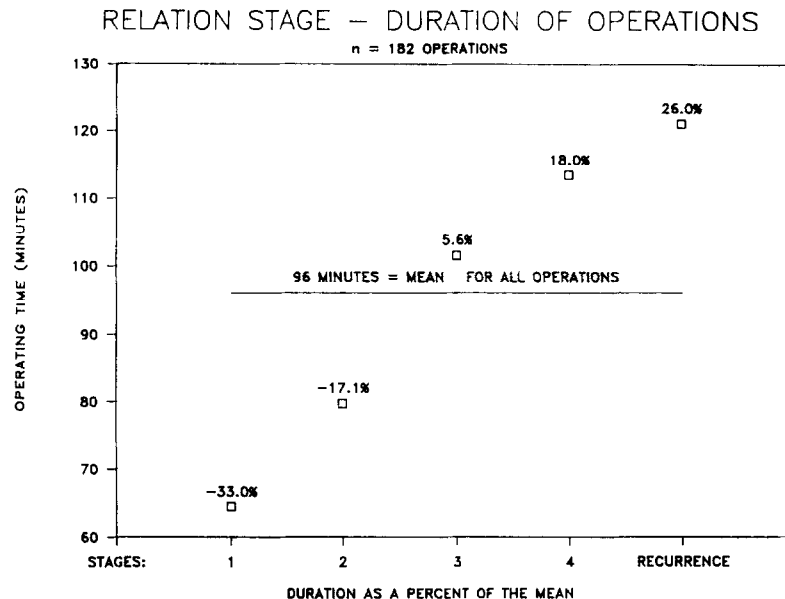
The topographic distribution of the pathologic aponeurosis is of interest. In 256 hands affected by Dupuytren's, 494 (38.6%) of the total 1280 rays were involved (Table I). The lesions were found essentially at the fourth ray, followed by the small finger and long finger. The fourth stage affected mostly the fifth ray, while stage 3 was divided equally between the fourth and fifth rays.

Surgical treatment was offered to 98 patients or 103 (40.2%) of the 256 hands seen in consultation. All postoperative follow-up was done between 3 and 6 months after operation.

**Surgical technique.** The operations were done by

two members of our surgical team (myself and Dr. G. Segmüller). An infraclavicular block was the anesthesia of choice. The routine tourniquet pressure was 250 mm Hg. If the dissection took more than 1.5 hours, a second tourniquet was applied to the forearm for another 1.5 hours. In this way, it was possible to work in a bloodless field for up to 3 hours.

There were only some minor variations in technique between the two surgeons. These consisted mostly of: (1) rotation flap versus cross-finger, and (2) location and number of Z-plasties. In our setting the operation is done with use of magnifying eye glasses ( $\times 2$  to 4.5). The incisions are mostly straight, along and centered by the pathologic fascia, a technique that allows a rotation flap to be placed wherever and whenever necessary. When this is not the case, skin closure is done with Z-plasties, mostly in the flexion folds. Fasciectomy



**Fig. 2.** A Gamma test demonstrates that the duration of the surgical procedure correlates with the staging: Gamma = 0.47 with a Z = 4.25; if Z = >1.65 for a unilateral test, then  $p = >0.05$ .

removes all of the palmar aponeurosis and the pathologic aponeurosis of the affected digits. To avoid formation of hematomas, the tourniquet is released before wound closure and large drain holes are left.<sup>8</sup>

There were 83 men and 15 women in the operative group, and five men had bilateral surgery. These 103 hands represented a total of 515 rays of which 239 (46.4%) were treated operatively. Sixteen cases were at stage 1, 22 at stage 2, 45 at stage 3, and 20 at stage 4. This was the initial surgery in 77 hands (74.8%), and 26 (25.2%) were recurrences.

**Duration of surgical procedure.** One hundred and eighty-two consecutively performed fasciectomies were reviewed and correlations sought between duration of operation and clinical staging. Such a correlation could be demonstrated with a Gamma test (Fig. 2). It would seem logical to expect that complications linked with Dupuytren's contracture would increase with disease progression because the distance of nerve and artery involved in the pathologic tissue increases proportional to the degree of infiltration.

**Operative complications.** There were two types of complications: perioperative (directly connected with the procedure itself) and postoperative (resulting from the fasciectomy itself). In this context, stiffness and reflex sympathetic dystrophy (RSD) are factors considered separately.

**Perioperative complications.** Perioperative complications are defined as those caused by a vessel lacer-

ation, nerve or tendon tear, whether alone or in combination. There were no perioperative amputations in this series resulting from an operative mishap. One finger was amputated 1 year afterward because of persistent complaints of dysesthesias after the primary fasciectomy.

The type of complication is related to staging and differentiation of primary procedures from a recurrence. Eight nerves and 10 arteries were sectioned, representing 18 of 103 hands (17.5%). In the 77 primary surgical procedures, only one nerve and two arteries were accidentally sectioned: 3 of 77 (3.9%). These all occurred in stage 3. The 15 remaining lesions occurred during reoperation for stage 3 or 4 cases (57.7% or 17/26).

Analysis of the complication rate for each operated hand does not give a realistic picture since each operated ray represents an intrinsic operative risk. In fact, 169 rays in 77 primary Dupuytren's contracture were operated on with a complication rate of 1.8% per operated ray. In the 26 relapses, 15 (21.4%) complications occurred for 70 digital rays.

Three hematomas and one infection were noted. The amputation was a secondary procedure (discussed previously). Two arthrodeses were performed because of the disorder's severity (stage 4 with contracture of skin, joint and tendon). There was one postoperative transient paralysis (4 days) of all muscles of the forearm and of the operated hand. Although a mild case of diabetes

**Table II.** Occurrence of stiffness

Stiffness	Stage 1		Stage 2		Stage 3		Stage 4		Total <i>ps + re</i>
	<i>ps</i>	<i>re</i>	<i>ps</i>	<i>re</i>	<i>ps</i>	<i>re</i>	<i>ps</i>	<i>re</i>	
None	12	0	14	1	14	2	3	4	43 + 7 = 50 48.5%
Minimal	4	0	5	0	14	4	1	0	24 + 4 = 28 27.2%
Moderate	0	0	1	0	3	3	4	4	8 + 7 = 15 14.6%
Important	0	0	1	0	1	4	0	4	2 + 8 = 10 9.7%
Total op.	16	0	21	1	32	13	8	12	77 + 26 = 103
Total stiffness	4	0	7	0	18	11	5	8	34 + 19 = 53
%	25	0	33	0	56	85	63	67	44 73

Definition of stiffness: Minimal: Contact between fingertip and palm still possible; Moderate: Distance between fingertip and palm less or equal 3 cm; Severe: Distance between fingertip and palm more than 3 cm; *ps*, Primary surgery (77); *re*, reoperation (26); %, percentage of hands that became stiff after operation. Conclusion: Stiffness increases as a function of staging and of recurrence.

**Table III.** Frequency of stiffness as a function of stage

Stage	Stiff	Not stiff	
Stage 1	4 (25.0%)	12 (75.0%)	16
Stage 2	7 (31.8%)	15 (67.2%)	22
Stage 3	29 (64.4%)	16 (36.6%)	45
Stage 4	13 (65.0%)	07 (35.0%)	20
TOTALS	53 (51.5%)	50 (48.5%)	103 (100%)

Chi-square test tests the accuracy of fit between an observed sample distribution and that expected for the population. Variables are nominal (stiff/not stiff). Because the rate of stiffness seems to correlate with the stage, we can verify if the following hypothesis is statistically acceptable: Hypothesis: The rate of the postoperative stiffness correlates with the stage of the illness. Degree of freedom: 3 df. Hypothesis can be accepted with a level of significance of 0.05 ( $p > 0.05$ ) if  $\chi^2 > = 7.82$ , or with a level of significance of 0.01 ( $p > = 0.01$ ) if  $\chi^2 > = 11.34$ . In our case  $\chi^2 = 12.39$ . The hypothesis can be accepted with a level of significance equal to 0.01 ( $p > = 0.01$ ). Conclusion: A correlation exists between the stage of the illness and stiffness observed after operation.

was present, the exact cause remains obscure. The operative time was less than 90 minutes, and no excessive tourniquet pressure could be demonstrated (tested postoperatively as well).

**Postoperative complications: I. Stiffness** (Table II). Stiffness, that occurs without significant pain, results mostly from scarring and chronic swelling. Stiffness was present in 51.5% of the operated group, but was minimal in 28 of the 53 patients, since the palm could still be touched with the fingertips. Among these 28 patients with minimal stiffness, only 5 were operated on for a recurrence. The stiffness was moderate in 15 patients; 7 of them were operated on for a recurrence (the fingertips could no longer reach the palm, with the distance from fingertip to palm being less than or equal to 3 cm). The remaining 10 patients had a severe stiffness. The distance from the fingertips to the palm al-

**Table IV.** Stiffness as related to operation (primary or reoperation)

	Stiff	Not stiff	Total hands
Primary	34 (44.16%)	43 (55.84%)	77
Reoperation	19 (73.08%)	7 (26.92%)	26
TOTAL	53	50	103

Same conditions as Table III. Hypothesis: the rate of stiffness is significantly higher when a patient has reoperation.  $\chi^2 = 6.51$ ,  $df = 1$ . Hypothesis can be accepted with a level of significance equal to 0.05 if  $\chi^2 > = 3.84$ , or with a level of significance equal to 0.01 if  $\chi^2 > = 6.65$ . Conclusion: Stiffness occurs significantly more often after reoperation.

ways exceeded 3 cm; 8 of these patients were reoperated for a recurrence.

Frequency of stiffness increased as a function of staging (Table III); 25% at stage one, 65% at stage 4; and 73.1% where there had been a recurrence. It was significantly different between the primary and the recurrent (Table IV) surgical cases. When only primary cases are considered, stiffness in stage 1 to 2 (11 of 37) is significantly different from stage 3 to 4 (23 of 40), without differing in frequency between men and women.

**II. Reflex sympathetic dystrophy.** Reflex sympathetic dystrophy (RSD), whose origin remains unclear, is characterized by a relatively late onset, and increases gradually in intensity. RSD is a complex of continuous pain, swelling, stiffness, skin changes, altered vasomotor and sudomotor patterns. The pain is intense, diffuse, persistent, and burning. The character of the pain allowed us to best differentiate between "pure" stiffness (see I) and RSD.

RSD complaints were not observed in 82.5% of patients during the normal postoperative course. Reports

**Table V.** Occurrence of RSD related to stage

	Stage 1	Stage 2	Stage 3	Stage 4	Total hands
Minimal	0	1	3	1	5 26.3%
Moderate	1	2	5	1	9 47.4%
Severe	1	1	3	0	5 26.3%
	2	4	11	2	19 100%
	10.5%	21.1%	57.9%	10.5%	100%

Conclusion: No correlation exists between RSD and stage.

of persistent, burning pains, edema, stiffness and swelling of the operated part were present in 19 hands (Table V) of whom the majority were women. Furthermore, 40% of all the women in this series had characteristic complaints of RSD. The difference between men and women is statistically significant ( $p < 0.02$ , Table VI). The works of Hill,<sup>9</sup> MacFarlane,<sup>4</sup> Tubiana,<sup>10</sup> and Zemel et al.<sup>11</sup> have confirmed these findings.

### Discussion

This study demonstrates that the problems associated with fasciectomy are much greater than one might expect. The surgical trauma associated with the procedure can even exacerbate the disease itself.<sup>12</sup> Our view is similar to McFarlane<sup>4</sup> who stated, "it is not necessary, nor wise, to operate upon a patient simply because the disease is present." But, the presence of a large tender nodule interfering with function would constitute a valid operative indication. In a general way, surgery is justified for a contracture of at least 30 degrees or more at the MP joint, for the eventual risk of postoperative complications appears in more than 50% of the operated group. It would be wise to use guanethidine,<sup>13, 14</sup> which can be combined with any form of anesthesia, especially for female patients, who are particularly susceptible to RSD.

The patient suffering from the juvenile form of Dupuytren's should be treated by an experienced hand surgeon, since this form evolves rapidly. The initial treatment will most often determine prognosis because in time more than one reoperation will be necessary. Even a simple closed fasciectomy is a very delicate procedure,<sup>15</sup> and the indications are limited to elderly patients.

Theoretically, the aim of any surgical procedure is to restore function and avoid recurrences, which are so difficult to treat. It would seem immediately obvious that a systematic and total fasciectomy of the palmar fascia should be done in every case initially, even if only one ray is infiltrated. The operative risks of the

**Table VI.** Occurrence of RSD related to sex

	RSD	No RSD	Total hands
Male	13 (14.77%)	75 (85.23%)	88
Female	6 (40.00%)	9 (60.00%)	15
	19 (18.45%)	84 (81.55%)	103

The variables are nominal (RSD/no RSD). Hypothesis: The rate of RSD is more frequent in females. Hypothesis can be accepted with a level of significance equal to 0.05 if  $\chi^2 > = 3.84$  ( $p > = 0.05$ ) equal to 0.02 if  $\chi^2 > = 5.42$  ( $p > = 0.02$ ) equal to 0.01 if  $\chi^2 > = 6.64$  ( $p > = 0.01$ ). In our case  $\chi^2 = 6.18$ ,  $df = 1$ . The hypothesis can be accepted with a level of significance equal to 0.02 ( $p > = 0.02$ ).

Conclusion: RSD is sex related.

first surgical procedure are minimal, when compared to the perioperative and postoperative complications arising from a "second look" operation.

Millesi<sup>2</sup> demonstrated that the evolution of the disease is definitely less aggressive after total fasciectomy (in a 5-year follow-up). On the contrary Hueston<sup>1</sup> states that, "there is no longer any place for the prophylactic radical fasciotomy" but he also recognizes that complications are directly related to the skill of the surgeon. According to Millesi's observations and the fact that reoperations are so difficult, we suggest the surgeon be more aggressive in the primary operation.

Hueston<sup>16</sup> recommends skin excision and replacement with total skin grafts. In our practice we recommend and use a local rotation flap<sup>17</sup> or cross-finger flap if there are no pathologic changes in the adjoining digit.

The frequency of postoperative hematoma (3 of 103) was minimal when compared to the literature (7.5% to 22.8%).<sup>10, 18, 19</sup> Our results were probably due to the tracks created by large open skin drainage.<sup>8</sup> In one of our cases with a hematoma, there was a hemorrhagic diathesis, which should have been detected before operation. With recurrence, the reoperated scar tissue leads to diffuse bleeding, which explains the resulting hematoma (two cases).

Nerve lesions were reported in 5% to 7% in various

studies.<sup>10, 20</sup> While only one nerve was cut in the 77 primary Dupuytren's cases, there were 7 in the 26 re-operated cases. For obvious reasons it is essential to be clear about whether the lacerations occur in primary or secondarily operated cases. Considerable technical skill is required to separate a nerve or artery buried in a scarred tissue mass. A global evaluation of complications would seem irrelevant unless the rate is related to the number of operated rays and disease stage. The advent of microsurgical methods have simplified the application of various techniques which hitherto were not feasible. The "cost" of these various techniques in terms of dysesthesias after nerve laceration, and cold intolerance after arterial injury may appear excessive. But, they should be related to the amputations that are prevented.

The frequency of postoperative stiffness are high, but does not seem to be unique to our group of patients. McFarlane<sup>4</sup> has reported 84% perfect results with regard to mobility of the MP joint, while it has never been more than 45% for the PIP joint. In addition, we found only a 20% perfect result for fifth digit surgery, while 25% were worse and 55% unchanged. These results confirm our findings and those of Green et al.<sup>21</sup> This study has emphasized the significant increase of stiffness as related to recurrences and stage but not to sex.

RSD is a more subtle matter since the diagnostic criteria are unclear, especially in the early cases. Nevertheless, it is evident that RSD affects women significantly more often than males, and the explanation still remains to be determined. Following these observations, all female patients operated on in this Center receive a guanethidine block during the operation. The best method of administering guanethine remains a matter for further study.

### Conclusions

The surgical treatment of Dupuytren's disease remains a major problem. The operative indications must be considered carefully, and it should be emphasized that a contracture of 30 degrees or greater in the MP joint justifies surgery. Microsurgical methods are essential, and given the complexity of the structures involved, the surgeon must have a strong background in pathophysiology and diverse surgical experience. He must be able to cope easily with any presenting complex arterial and/or nerve lesions, as well as the different problems of skin coverage. The presence of various tendons and joint contractures must also figure in the evaluation of the surgical procedure.

The importance of postoperative treatment and rehabilitation cannot be emphasized sufficiently. The use

of static and dynamic splints is mandatory for a successful completion of the long and difficult process of rehabilitation. Surgical treatment of Dupuytren's contracture remains the province of a specialized group composed of hand surgeons and skilled rehabilitation personnel experienced in hand treatment. They have to also manage the physical and psychologic problems. The development of a specialized unit, such as a Pain Clinic, can offer much to the rehabilitative process after hand surgery.

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## Role of antibiotics in open fractures of the finger

**The role of antibiotics was investigated prospectively in 91 open fractures of the finger. Antibiotics were administered to alternate patients with open phalangeal fractures. Only finger fractures distal to the metacarpophalangeal joint were included. Both groups were treated with aggressive surgical irrigation and debridement. In four patients in each group clinical signs of infection eventually developed; osteomyelitis did not develop in any patients, and no secondary surgical procedures were required in either group. This data indicates that vigorous irrigation and debridement is adequate primary treatment for open phalangeal fractures in fingers with intact digital arteries. (J HAND SURG 1990;15A:761-4.)**

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The use of antibiotics in the treatment of open fractures of the long bones is widely accepted as standard treatment and their effectiveness has been proven in random prospective studies by Patzakis and associates<sup>1</sup> and Gustilo and Anderson.<sup>2</sup> Routine use of antibiotics in managing open fractures of the finger is less common and there is a noticeable paucity of objective literature to either support or refute their importance.

The effectiveness of antibiotics in grossly contaminated or marginally viable wounds has been established by Burkhalter et al.<sup>3</sup> and Cooney et al.<sup>4</sup> Isolated soft

tissue wounds in the upper extremity may be treated with local care alone without the increased risk of infection as shown in two separate studies by Grossman and colleagues<sup>5</sup> and Thirlby and associates.<sup>6</sup> Wavak<sup>7</sup> studied 100 consecutive hand injuries treated early with antibiotics and noted an infection rate of approximately 6%.

A review of five basic text books, Lister,<sup>8</sup> Buck-Gramcko,<sup>9</sup> Beasley,<sup>10</sup> Flatt,<sup>11</sup> and Green<sup>12</sup> revealed a unanimous recommendation that antibiotics not be routinely used in the management of acute hand injuries. Coyle and Leddy,<sup>13</sup> on the other hand, recommended that antibiotics are advisable for injuries in the distal finger.

Two studies deal directly with the role of antibiotics in finger fractures. Sloan et al.<sup>14</sup> analyzed distal phalangeal fractures prospectively and found a 30% increase in the incidence of infection when antibiotics were not used. All amputations in this group, however, were treated by primary closure with either free graft or V-Y flap. Peacock et al.<sup>15</sup> noted an increased risk of side effects with antibiotics, as well as, a potential

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