新生儿管状长骨骨折的损伤机制、诊断方法与治疗手段研究

FRACTURES OF LONG TUBULAR BONES IN NEWBORNS: MECHANISMS OF INJURIES, METHODS OF DIAGNOSIS, AND TREATMENT

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背景。目前缺乏关于新生儿管状骨骨折创伤急救护理的医学信息。
目的。本文献综述旨在向小儿创伤科医师阐述新生儿长管状骨骨折的主要损伤机制、诊断方法与治疗手段。
材料与方法。本文系统性分析了国内外60篇从1986年至2018年针对新生儿管状长骨骨折的科学文献。本篇文献综述撰写工作运用了以下现代医学信息电子数据库：PubMed、MEDLINE、乌利希期刊指南（Ulrich's Periodicals Directory）、开放存取期刊目录（DOAJ）、数控列宁图书馆（Cyberleninka）、eLibrary.
结果与讨论。与相关文献的分析相似，新生儿肢段骨折的主要机制是产期创伤，包括产道分娩与剖腹产时遭受的创伤。骨折的诱发因素包括子宫内骨量减少、消化系统先天性疾病与早产。根据临床检验与受损肢体的超声及X射线检查结果，进行骨折诊断。肢体骨折的治疗，往往同时采取保守及外科治疗方式。近年来发表的科学论文出现一明显趋势：强调不断将经骨骨接合术等手术方法纳入新生儿长管状骨骨折固定的临床实践当中。
结论。本文填补了新生儿肢体骨折治疗文献综述的空白。
关键词：新生儿；管状长骨骨折；损伤机制；诊断；治疗

Background. Medical information on the provision of emergency trauma care to newborns with fractures of tubular bones is scarce.
Aim. This scientific review aimed to inform children's orthopedic traumatologists regarding the main mechanisms of injury, methods of diagnosis, and treatment of fractures of long tubular bones in newborns.
Material and methods. The article presents a systematic analysis of 60 scientific works of domestic and foreign authors on topical aspects of fractures of long tubular bones in newborns from 1986 to 2018. For writing the literature review, we used modern electronic databases of medical information: PubMed, MEDLINE, Ulrich's Periodicals Directory, DOAJ, Cyberleninka, and eLibrary.
Results and discussion. Similarly from the analysis of scientific publications, the main mechanism of fractures of limb segments in newborns is intranatal trauma, in which the child can receive both during birth through the birth canal and during cesarean section. The predisposing factors for obtaining bone fractures are intrauterine osteopenia, congenital diseases of the digestive system, and prematurity. Fractures are diagnosed on the basis of clinical examination and results of ultrasound and X-ray studies of the injured limb. In the treatment of limb bone fractures, both conservative and surgical methods are used. In recent years, a tendency has been clearly observed in scientific publications, highlighting the ever-widening introduction into clinical practice of operational methods for stabilizing fractures of long tubular bones in newborns, including using the techniques of transosseous osteosynthesis.
Conclusion. The presented article fills the existing gap of summarizing scientific publications on the treatment of fractures of limbs in newborns.

Keywords: newborns; fractures of long tubular bones; injury mechanisms; diagnosis; treatment.

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引言

在目前发表的所有文献中，鲜有学者研究新生儿管状骨骨折的创伤急救护理问题。本文报道了与新生儿长管状骨骨折损伤机制、诊断方法与治疗手段有关的学术信息。

材料与方法

本文运用现代电子医学信息数据库[PubMed、MEDLINE、乌利希期刊指南（Ulrich’s Periodicals Directory）、开放存取期刊目录（DOAJ）、数控列宁图书馆（Cyberleninka）、eLibrary]，回顾了新生儿管状长骨骨折研究。由于该课题报道资源缺乏，文献检索深度（60篇文献）为30年。

结果与讨论

分娩创伤是管状长骨等骨折的主要病因 [1-3]。因产前所致神经肌肉病 [4,5]、骨质疏松症 [6]或成骨不全症 [7，8]造成的子宫内骨折十分罕见。有文献阐述了新生儿自发性管状长骨骨折病例，患儿甚至没有最轻微的外部暴露因素，在出生后立即转诊至加护病房接受治疗 [9，10]。

分娩时对新生儿骨骼造成损伤最常见的原因顺产时 [11，12] 及剖腹产分娩 [13-17]时妇产科医师与助产护士采取的助产手段。没有一种观点认为助产术（顺产或剖腹产）最容易造成分娩损伤。部分研究者认为，产道分娩时造成的创伤最为严重 [18-21]，而有些学者则确信，剖腹产具有骨折风险，尤其是紧急情况下进行的剖腹产 [22－25]。除了产科操作问题，造成骨骼分娩损伤的高危因素还包括：胎儿体型较大、骨盆临床狭窄、子宫肌瘤较大、产妇既往多次妊娠以及急产或完全相反的滞产 [19，26]。

在新生儿出生的头几周或头几月，骨量减少会诱发骨折；据报道，早产儿骨折频率为20%至60%（根据胎龄和新生儿的体重不同） [27－29]。大约10%的早产儿被诊断为骨折，平均发病年龄为2至3个月 [30]。消化系统器官先天性疾病、利尿治疗、肠外营养缺乏微量元素（尤其是钙和磷），会延长骨量减少的病程 [27，29－33]。对于该类婴儿，医务人员或家长即便给予最为细致小心的护理，骨折的风险也无处不在 [34]。因而在骨折病例中，肋骨骨折最为高发，因为胸腔一直受到外界的影响 [30]，其次是肱骨与股骨的骨折 [3，20，23]。

因此，对出版文献分析后发现，新生儿肱骨骨折的平均发生率为0.1%，即每1000名存活新生儿中，有1例肱骨骨折 [35]。分娩过程中，骨折的主要原因是肩难产，即胎头娩出后，前肩娩出受阻长达60秒，如不采取助产术，则无法娩出 [36，37]。与一般人群相比，出现肩难产时肱骨骨折的发生频率增加，已占到临床病例的3% [38，39]。新生儿肱骨骨折的平均诊断时间大约为产后40小时 [40]，除了X光片，对受伤肢体的超声检查对确诊十分有利 [34，41－43]。应对肱骨骨折进行鉴别诊断以排除臂丛神经炎、骨髓炎、前臂骨脱位与先天性发育异常 [35，44]。

骨折一般通过石膏与数条固位绷带采取保守治疗[41，42]，但有些病例也需要进行手术治疗 [40，43]。因此，在拉蒂等人 [23]的报道中，33例子宫内肱骨下三分之一处骨折的新生儿里，有29例（88.0%）采取保守治疗，其余四例（12.0%）采用手术治疗。不论采取何种治疗方法，长期效果分析证实，88%的病例肩轴恢复正常，80%患儿受损肢体的肘关节完全恢复正常幅度。

新生儿股骨骨折的诊断频率明显低于肱骨骨折 [21]，平均发生频率为每1000名新生儿中有0.13例 [45]。同样的，该部位骨折常见于采用了多种助产技术的产道分娩过程 [11，12]。股骨骨折也可能见于剖腹产，一般同时累及左右两骨，而非单骨 [14，15，25，46]。因此，托克等人 [24]分析了221939例分娩病例的并发症，结果发现，顺产的股骨骨折发生率为每1000名新生儿0.077例；而在剖腹产时，发生率比前者高四倍（每1000名新生儿0.308例）。一种有效的方法可以防止分娩时严重的新生儿管状长骨损伤：在剖腹产过程中避免对子宫下段采用纵切口 [47]；使用适量的麻醉处理，方便妇产科医生小心地将胎儿从完全松弛的子宫内取出 [11]。

为客观地诊断股骨骨折，临床上通常对受损肢体进行X射线检查。最终诊断通常不是在分娩后立即确定，而是在分娩后一段时间，有时长达4天 [16]。

新生儿股骨骨折治疗通常较为保守 [40，42]，一般采用上述比较成熟的方法 [49－51]。相关文献也包括新生儿外科治疗报道。因此，在奈卫斯坦克等人 [52]的报道中，14例分娩期股骨骨折的新生儿里，有3例（21.42%）接受了经骨骨接合术。手术指征包括股肢段开放性骨折（一例）

与明显髋部成角畸形（两例）。研究者指出，在这些病例中，外部固定装置能够使骨片位置较为理想，有助于受伤婴儿的护理，缩短骨折愈合期。

对新生儿股骨骨折使用Mini Penning Orthex外固定设备，适用于因任一原因无法采用传统疗法的病例 [53]。此类病例包括：临床观察期间，医生为股骨骨折患儿安排了手术等医疗操作，当腹部器官、功能性牵引或髋股石膏绷带会严重阻碍腹部干预时 [31]。对新生儿进行经骨骨接合术时，应首先考虑该疗法固有的炎性并发症，因为在儿科临床实践中出现该类并发症的病例高达40% [54]。

在位小儿股骨骨折确定疗法时，应当关注斯特罗姆等人 [55]的研究。该研究分析了德国门诊756例3岁以下的股骨骨折病例。受伤患儿接受保守治疗和外科治疗的频率大致相同，临床病例占比分别为49%和51%。因此，这种动态可以清晰得追溯到当积极手术治疗增长成为股骨骨折的小儿患者提供创伤护理的时期。

新生儿股骨骨折的愈合期为3 [14，16]至16 [50]周不等。治疗结果通常能让主治医师满意。3° 以内的外翻与5° 以内的反向弯曲为股段轴允许偏差范围 [50]。然而，对于超过这些范围的畸形病例，专科医师采取期待疗法，安排患者随访，希望通过机体代偿功能改善病情 [11，51]。

同时，针对新生儿期患儿手术干预治疗后果的相关文献研究也值得注意。戈洛米多夫等人 [56]指出，遗传生长计划实施过程中的神经精神发育迟缓与损伤是新生儿手术的常见后果，表现为生理发育迟滞。此外，接受过手术治疗的婴儿可出现重要机体系统功能异常；但幼儿对手术的耐受性更好 [57]。

沙斯汀 [58]的研究表明，幼儿股骨骨折的手术干预频率正在逐步增长，这一趋势有待进一步理解与分析。该研究指出，一方面，电极与光学转换器控制下的金属骨接合术新技术，简化了骨折复位及稳固技术，最终对手术患儿的生活质量产生了积极的影响。另一方面，手术常见于采用保守治疗即可的病例，但出于多种原因，手术成为人们优先选择的治疗手段。

结论

现代医学文献分析表明，虽然产期医学在诸多方面有发展与进步，但许多问题仍未被解决[59，60]。对于小儿创伤学，目前的当务之急是解决管状长骨骨折新生儿的专科护理问题，同时改善小儿骨科创伤医师采取的公认诊治策略。

本文献综述填补了目前新生儿肢体骨折治疗研究概述的空白。

其他信息

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利益冲突。作者声明，不存在与本文发表有关的明显及潜在利益冲突。

作者贡献

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M.A. Akselrov运用电子医学信息数据库PabMed进行文献检索，并负责分析文献来源。

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