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Praziquantel

Updated: July 20, 2020.

OVERVIEW

Introduction

Praziquantel is an anthelmintic agent with activity against a broad spectrum of trematodes and cestodes that is used predominantly in the therapy of schistosomiasis, liver flukes, and cysticercosis. Praziquantel therapy has been reported to cause serum aminotransferase elevations during therapy, but clinically apparent liver injury after its use is rare if it occurs at all.

Background

Praziquantel (praz" i kown' tel) is a heterocyclic prazino-isoquinoline derivative with a broad spectrum of activity against several trematodes (Fasciola, Schistosoma) and cestodes (Taenia). Praziquantel is believed to act by interference with tegument calcium transport, resulting in paralysis of the parasitic worms with subsequent loss of adherence to tissue, degradation and expulsion. Praziquantel was approved for use in the United States in 1982 for schistosomiasis and subsequently for clonorchiasis. Praziquantel is also commonly used in veterinary medicine. Praziquantel is available for human use in tablets of 600 mg generically and under the brand name Biltricide. The typical dose for treating schistosomiasis in adults is 20 mg/kg (depending upon the species) three times over one day. The dose for treating clonorchiasis is 25 mg/kg three times over one day. Side effects are common but transient, and include abdominal discomfort, nausea, vomiting, vertigo, muscle aches, drowsiness, headaches and fatigue, some of the symptoms being due to its effects on the parasites. Serious adverse events include transient clinical deterioration, cardiac arrhythmias, hypersensitivity reactions and rash.

Hepatotoxicity

Praziquantel therapy has been associated with elevations in serum aminotransferase levels in up to 27% of patients, but these abnormalities were self-limiting. Praziquantel has been rarely associated with clinically apparent liver injury, which generally accompanied hypersensitivity reactions such as rash and fever. In a large retrospective survey from China, 2 of 25,000 treated patients were reported to have developed jaundice after praziquantel therapy, but no specific information about the two cases was provided. There have been few studies of long term therapy with praziquantel, and most controlled trials of this agent have used one day courses without serum aminotransferase monitoring. However, millions of people have been treated with praziquantel as a part of large scale control strategies in China where schistosomiasis Japonica is endemic. The combination of praziquantel preventive therapy and snail control has resulted in marked decreases in the prevalence of infection in the population with no evidence of significant toxicity. Thus, mild acute liver injury can accompany systemic hypersensitivity reactions to praziquantel, but both the allergic reaction and the liver injury tend to be short-lived and resolve rapidly even without specific therapy.

Likelihood score: D (possible rare cause of clinically apparent liver injury usually as a part of a systemic hypersensitivity reaction).

Mechanism of Injury

Praziquantel is extensively metabolized by the liver via the cytochrome P450 system and might cause hepatic injury as a result of a toxic intermediate of its metabolism. Plasma levels of praziquantel are affected by inducers (rifampin decreases drug levels) and inhibitors of P450 activity (cimetidine, ketoconazole and erythromycin can reduce drug levels).

Outcome and Management

Praziquantel is usually well tolerated and clinically apparent liver injury due to its use is rare. There is no evidence for cross sensitivity to other anthelmintic agents.

Drug Class: Anthelmintic Agents

PRODUCT INFORMATION

REPRESENTATIVE TRADE NAMES

Praziquantel – Biltricide®

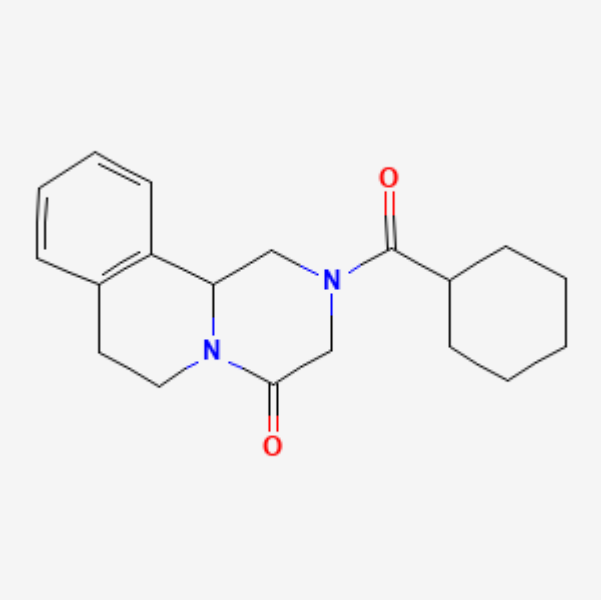
DRUG CLASS

Anthelmintic Agents

COMPLETE LABELING

Product labeling at DailyMed, National Library of Medicine, NIH

CHEMICAL FORMULA AND STRUCTURE

DRUG	CAS REGISTRY NUMBER	MOLECULAR FORMULA	STRUCTURE
Praziquantel	55268-74-1	C19-H24-N2-O2	

ANNOTATED BIBLIOGRAPHY

References updated: 20 July 2020

Zimmerman HJ. Antihelminthics. Hepatic injury from antimicrobial agents. In, Zimmerman HJ. Hepatotoxicity: the adverse effects of drugs and other chemicals on the liver. 2nd ed. Philadelphia: Lippincott, 1999, pp. 626-8.

(Expert review of hepatotoxicity of anthelmintics written in 1999; praziquantel has been reported to cause serum aminotransferase elevations).

Keiser J, McCarthy J, Hotez P. Chemotherapy of helminth infections. In, Brunton LL, Hilal-Dandan R, Knollman BC, eds. Goodman & Gilman's the pharmacological basis of therapeutics. 13th ed. New York: McGraw-Hill, 2018, pp. 1001-9.

(Textbook of pharmacology and therapeutics).

Chen MG, Fu S, Hua XJ, Wu HM. A retrospective survey on side effects of praziquantel among 25,693 cases of schistosomiasis Japonica. Southeast Asian J Trop Med Public Health. 1983;14:495–500. PubMed PMID: 6673126.

(Retrospective survey of side effects after a 1-2 day course of praziquantel for Schistosomiasis in 25,693 patients from China; 2 patients developed jaundice 1-5 days after treatment, both resolving within 2 weeks; 2 other patients with advanced liver disease had acute decompensation shortly after therapy; no details given).

Matthaiou DK, Panos G, Adamidi ES, Falagas ME. Albendazole versus praziquantel in the treatment of neurocysticercosis: a meta-analysis of comparative trials. PLoS Negl Trop Dis. 2008;2:e194. PubMed PMID: 18335068.

(Systematic review of efficacy of albendazole versus praziquantel; mentions that there were no differences in rates of adverse events, but no details given).

Yangco BG, De Lerma C, Lyman GH, Price DL. Clinical study evaluating efficacy of praziquantel in clonorchiasis. Antimicrob Agents Chemother. 1987;31:135–8. PubMed PMID: 3551827.

(Controlled trial of praziquantel vs placebo in 42 patients with clonorchiasis treated for one day twice 30 days apart; side effects included nausea, vomiting and dizziness, but there were no increases in ALT levels).

Seo BS, Lee SH, Chai JY, Hong ST. Praziquantel(Distocide®) In treatment of Clonorchis Sinensis infection. Kisaengchunghak Chapchi. 1983;21:241–5. PubMed PMID: 12902655.

(Among 55 Korean patients with liver flukes treated with praziquantel [75 mg/kg over one day], none developed clinical liver injury and average serum AST levels did not change).

Ross AG, Sleigh AC, Li Y, Davis GM, Williams GM, Jiang Z, Feng Z, McManus DP. Schistosomiasis in the People's Republic of China: prospects and challenges for the 21st century. Clin Microbiol Rev. 2001;14:270–95. PubMed PMID: 11292639.

(Review of the burden of schistosomiasis japonica infections in China and approaches to treatment and prevention including use of praziquantel in the general population).

Shen C, Choi MH, Bae YM, Yu G, Wang S, Hong ST. A case of anaphylactic reaction to praziquantel treatment. Am J Trop Med Hyg. 2007;76:603–5. PubMed PMID: 17360893.

(35 year old man with clonorchiasis developed dizziness, urticaria, dyspnea, palpitations and nausea after a single dose of praziquantel with abnormal aminotransferase levels [ALT 81 U/L, AST 132 U/L], symptoms resolving within a few days).

Chalasani N, Fontana RJ, Bonkovsky HL, Watkins PB, Davern T, Serrano J, Yang H, Rochon J; Drug Induced Liver Injury Network (DILIN). Causes, clinical features, and outcomes from a prospective study of drug-induced liver injury in the United States. Gastroenterology. 2008;135:1924–34. PubMed PMID: 18955056.

(Among 300 cases of drug induced liver disease collected in the US between 2003 and 2008, none were attributed to an anthelmintic agent).

Devarbhavi H, Dierkhising R, Kremers WK, Sandeep MS, Karanth D, Adarsh CK. Single-center experience with drug-induced liver injury from India: causes, outcome, prognosis, and predictors of mortality. Am J Gastroenterol. 2010;105:2396–404. PubMed PMID: 20648003.

(313 cases of drug induced liver injury were seen over a 12 year period at a large hospital in Bangalore, India; none were attributed to anthelmintic agents).

Ferrajolo C, Capuano A, Verhamme KM, Schuemie M, Rossi F, Stricker BH, Sturkenboom MC. Drug-induced hepatic injury in children: a case/non-case study of suspected adverse drug reactions in VigiBase. Br J Clin Pharmacol. 2010;70:721–8. PubMed PMID: 21039766.

(Worldwide pharmacovigilance database contained 9036 hepatic adverse drug reactions in children, there were no anthelmintic agents listed among the top 40 implicated medications).

Drugs for parasitic infections. Treat Guidel Med Lett. 2013;11 Suppl:e1–31.

(Brief description of drugs for parasitic infections in adults and children as well as a table of their major side effects; praziquantel is the drug of choice for schistosomiasis, liver flukes [Clonorchis sinensis and others], and intestinal tapeworm; side effects can include abdominal pain, diarrhea, fatigue, nausea, drowsiness, fever and rash).

Wu W, Huang Y. Application of praziquantel in schistosomiasis japonica control strategies in China. Parasitol Res. 2013;112:909–15. PubMed PMID: 23358736.

(Summary of results of approaches to decreasing schistosomiasis japonica infection in China with discussion of success and safety of praziquantel prophylaxis in the general population; no mention of hepatotoxicity).

Hernández N, Bessone F, Sánchez A, di Pace M, Brahm J, Zapata R, A, Chirino R, et al. Profile of idiosyncratic drug induced liver injury in Latin America. An analysis of published reports. Ann Hepatol. 2014;13:231–9. PubMed PMID: 24552865.

(Systematic review of literature of drug induced liver injury in Latin American countries published from 1996 to 2012 identified 176 cases, only one of which was attributed to an anthelmintic, mebendazole; none were attributed to praziquantel).

Chalasani N, Bonkovsky HL, Fontana R, Lee W, Stolz A, Talwalkar J, Reddy KR, et al; United States Drug Induced Liver Injury Network. Features and outcomes of 899 patients with drug-induced liver injury: The DILIN Prospective Study. Gastroenterology. 2015;148:1340–52.e7. PubMed PMID: 25754159.

(Among 899 cases of drug induced liver injury enrolled in a US prospective study between 2004 and 2013, 409 [46%] were attributed to antimicrobial agents, but none to anthelmintics or to praziquantel).

Qian MB, Utzinger J, Keiser J, Zhou XN. Clonorchiasis. Lancet. 2016;387(10020):800–10. PubMed PMID: 26299184.

(Review of the life cycle, epidemiology, clinical course and complications of Clonorchis sinensis infection mentions that praziquantel is the treatment of choice and is used in mass prevention and is highly effective with only transient and mild adverse events; no mention of liver test abnormalities).

Gassiep I, Clark PJ, McManus DP, Looke DL. Hepatobiliary and pancreatic: Acute hepatitis in the setting of chronic Schistosoma mansoni infection and post-praziquantel therapy. J Gastroenterol Hepatol. 2016;31:910. PubMed PMID: 26598933.

(19 year old man with hepatomegaly [bilirubin 3.0 mg/dL, ALT 1220 U/L, Alk P 331 U/L] and stool tests showing S. mansoni had delayed but ultimately full resolution of liver test abnormalities after praziquantel therapy).

Gong Z, Xu Z, Lei C, Wan C. Hepatic paragonimiasis in a 15-month-old girl: a case report. BMC Pediatr. 2017;17:190. PubMed PMID: 29141594.

(15 month old female with fever and hepatomegaly and multiple low density hepatic lesions had hepatic paragonimiasis on liver biopsy and resolution after 3 days of praziquantel therapy).

Sayasone S, Keiser J, Meister I, Vonghachack Y, Xayavong S, Senggnam K, Phongluxa K, et al. Efficacy and safety of tribendimidine versus praziquantel against Opisthorchis viverrini in Laos: an open-label, randomised, non-inferiority, phase 2 trial. Lancet Infect Dis. 2018;18:155–61. PubMed PMID: 29153938.

(Among 607 children with O. viverrini liver fluke infection treated with tribendimidine or praziquantel, cure rates were 97% vs 95% while adverse events rose in the days following treatment in 33% vs 70%, usual symptoms with praziquantel being headache, nausea, dizziness, fatigue and abdominal cramps; no mention of ALT elevations or hepatotoxicity).

Hong ST. Albendazole and praziquantel: review and safety monitoring in Korea. Infect Chemother. 2018;50:1–10. PubMed PMID: 29637747.

(Korean registry of adverse event reports made between 2006 and 2015 included 108 praziquantel events which were usually mild and transient gastrointestinal and neurologic symptoms, with one report of abnormal liver tests; no details provided).

McManus DP, Dunne DW, Sacko M, Utzinger J, Vennervald BJ, Zhou XN. Schistosomiasis. Nat Rev Dis Primers. 2018;4:13. PubMed PMID: 30093684.

(Extensive review of the pathogenesis, epidemiology, clinical course, complications and management of schistosomiasis mentions that praziquantel is the most effective and widely used therapy, is active against all Schistosoma species, but only against adult worms for which reason it does not prevent reinfection and can give rise to drug resistance; praziquantel has transient, mild adverse events most of which are attributable to worm release rather than direct effects of the drug).

Shindo T, Masuda Y, Imai Y, Nagano T, Nishioka H. Case Report: Acute generalized exanthematous pustulosis caused by praziquantel. Am J Trop Med Hyg. 2019;100:700–2. PubMed PMID: 30675838.

(30 year old man developed fever and rash the day after a single dose of praziquantel with abnormal liver tests [bilirubin 1.5 mg/dL, ALT 841 U/L, Alk P 468 U/L], symptoms resolving over the next week with normal tests 16 days later).

Darko SN, Hanson H, Twumasi-Ankrah S, Baffour-Awuah S, Adjei-Kusi P, Yar D, Owusu-Dabo E. Three monthly doses of 60 mg/kg praziquantel for Schistosoma haematobium infection is a safe and effective treatment regimen. BMC Infect Dis. 2020;20:323. PubMed PMID: 32375658.

(Therapy of 28 patients with S. haematobium infection with 3 monthly doses of praziquantel was highly effective and serum ALT, AST and GGT levels during the 3 months were no different than levels in 53 control subjects followed concurrently).