インスリンの腹膜灌流液投与システムへの吸着

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Binding of insulin to a continuous ambulatory peritoneal dialysis system

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ABSTRACT: The binding of insulin in two peritoneal dialysis solutions to polyvinyl chloride dialysate containers and an administration set and the effect of adding antibiotics to the dialysate solutions were studied in a simulated continuous ambulatory peritoneal dialysis (CAPD) system. Using a radiotracer method, binding of insulin to dialysate containers was determined at various times up to 48 hours after addition of 10, 20, 40, and 80 units of insulin each to 2 L of either 1.5% or 4.25% dextrose dialysate solution. The method was repeated in 1-L glass containers. Each of the dialysate solutions was then passed through a CAPD administration set to determine binding to the set' s cellulose ester membrane filter. In another experiment to simulate binding to the set in actual practice, three bags of 1.5% dextrose dialysate were alternately infused with one bag of 4.25% dextrose dialysate through a single CAPD set until eight bags of dialysate containing insulin 40 units were given over 48 hours. The ability of gentamicin sulfate and cephalothin sodium to release bound insulin from the CAPD filter was determined by passing 2 L of each dialysate solution containing either gentamicin 60 mg or cephalothin 500 mg through the set over an 18 minute period. The binding of these antibiotics to the dialysate bags was also studied using high performance liquid chromatography assays. Insulin binding to the bag increased with increasing insulin concentration and length of storage in the bag; binding was not significantly different between the two dialysate solutions except at the 80 unit/2-L concentration. Binding in glass containers was less than that in polyvinyl chloride bags. With the CAPD set, percent binding was greater at lower insulin concentrations. Binding sites in the filter were not saturated after administration of the first bag; increased contact time with the filter also increased insulin binding. During the simulation, about 20% of the total amount of insulin administered was adsorbed from the initial

bag of dialysate solution and about 10% from subsequent bags. Neither gentamicin nor cephalothin released bound insulin from the CAPD filter; only gentamicin was bound to the dialysate bag, more so in the 4.25% dextrose dialysate solution. When administering insulin via CAPD solutions, suitable excesses of insulin should be added to the solutions to ensure delivery of the desired dose to the patient. Storage of insulin-containing dialysate solutions should be limited to one hour to minimize binding. Loss of gentamicin sulfate but not cephalothin sodium given via CAPD solutions may be expected through binding to the CAPD filter.

抄録　腹膜灌流液に薬物を混合し、投与セットを通して腹膜腔へ注入・透析する際、薬物によっては、容器、投与セットに吸着するものがある。インスリンもそのひとつである。^{125}Iでラベルしたインスリンを1.5%，4.25%ブドウ糖腹膜灌流液に混合して、容器および270cm²という大きな面積を持つセルロースメンブランフィルターを組み込んだ投与セットへの薬物吸着量を測定した。また、それら溶液に硫酸ゲンタマイシンあるいはセファロチンナトリウムを混合した場合、すでに容器、投与セットなどに吸着しているインスリンが置換され液中に放出されるかどうか等も検討した。投与セットへのインスリン吸着は、インスリン濃度が低い程、吸着率（%）は高かった。投与セット中のメンブランフィルターの結合部位が薬物で飽和されるまで、薬物吸着は続くことがわかった。抗生物質を混合しても、吸着されたインスリンと置換することはなかった。臨床の場においては、吸着される量（約20%）をあらかじめ過量に腹膜灌流液に加えておくことおよび容器への吸着を考慮し、調製後1時間以内に投与することが適当だろう。

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