**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Abaci, 2015[1](#_ENREF_1) | Ioversol | IA | Arm 1: 117.7ml  Arm 2: 139.2ml | 1 | IV normal saline | IV |  |  |
|  |  |  |  | 2 | Risovustatin + IV normal saline | Oral | 20mg 2/day (total = 40) |  |
| Acikel, 2010[2](#_ENREF_2) | Iohexol | IA | Average Volume:  Arm1: 103ml  Arm2: 105ml  Arm3: 110ml | 1 | IV Normal Saline | IV | IV Normal saline 1ml/kg/h 4h prior until 24 after procedure | did not receive any cholesterol lowering medication |
|  |  |  |  | 2 | IV Normal Saline + Oral Atorvastatin | Oral, IV | 40mg/day of oral Atorvastatin, started 3 days before CM admin and continued for 48 hours after. | All participants received IV normal saline 1ml/kg/h 4h prior until 24 after procedure |
|  |  |  |  | 3 | IV Normal Saline + Chronic Statin Therapy (non-randomized group) | Oral, IV | Received statin therapy for at least 1 month before procedure (non-randomized group). Dose and type of stating not reported | All participants received IV normal saline 1ml/kg/h 4h prior until 24 after procedure |
| ACT, 2011[3](#_ENREF_3) | LOCM, IOCM, Other description, Also included high-osmolar contrast | IA | Not specified | 1 | Placebo | Oral | 1200mg b.i.d, 4800mg total, 48 hrs, Prior to CM administration After CM administration | 2 doses before and 2 doses after procedure. Powdered placebo diluted in water and given orally.  Hydration with 0.9% saline, 1 ml/kg per hour, from 6 to 12 hrs before to 6 to 12 hrs after angiography, was strongly recommended |
|  |  |  |  | 2 | Oral NAC | Oral | 1200mg b.i.d, 4800mg total, 48 hrs, Prior to CM administration After CM administration | 2 doses before and 2 doses after procedure. Powdered NAC diluted in water and given orally.  Hydration with 0.9% saline, 1 ml/kg per hour, from 6 to 12 hrs before to 6 to 12 hrs after angiography, was strongly recommended |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Albabtain, 2013[4](#_ENREF_4) | Ioxaglate | IA | Dose: 320mg of iodine  Mean volume: 87.6 (SD 80.4) ml | 1 | IV Normal Saline | Oral, IV | Standard hydration (not specified) | All participants received IV Normal Saline rate of 50-125 ml/h from randomization until 6 hours after procedure. |
|  |  |  |  | 2 | Oral Ascorbic Acid + IV Normal Saline | Oral, IV | 3g oral ascorbic acid, given 2 hours before angiogram, 2 g after angiogram, and 2 g 24 hours after angiogram. | All participants received IV Normal Saline rate of 50-125 ml/h from randomization until 6 hours after procedure. |
|  |  |  |  | 3 | Oral NAC + IV Normal Saline | Oral, IV | 600 mg oral NAC twice daily for 2 days, starting evening before procedure. | All participants received IV Normal Saline rate of 50-125 ml/h from randomization until 6 hours after procedure. |
|  |  |  |  | 4 | Oral NAC + Oral Ascorbic Acid + IV Normal Saline | Oral, IV | 3g oral ascorbic acid, given 2 hours before angiogram, 2 g after angiogram, and 2 g 24 hours after angiogram. In addition, given 600 mg oral NAC twice daily for 2 days, starting evening before procedure. | All participants received IV Normal Saline rate of 50-125 ml/h from randomization until 6 hours after procedure. |
| Alexopoulos, 2010[5](#_ENREF_5) | Iodixanol, Iomeprol, Iobitridol, Iopentol, Ioxaglate | IA | Average Volume:  IOCM: 279 ml (SD 138)  LOCM: 259 ml (SD 140) | 1 | IV Normal Saline + Oral Placebo | Oral, IV | Placebo at least 2 hours before the start of the index procedure, followed by 2 g of placebo the night and the subsequent morning after the procedure. | All participants given 50 to 125 mL/hr intravenous normal saline was started in all patients from randomization until at least 6 hours after the procedure. |
|  |  |  |  | 2 | IV Normal Saline + Oral Ascorbic Acid | Oral, IV | 3 g of ascorbic acid, supplied in chewable tablets, at least 2 hours before the start of the index procedure, followed by 2 g of ascorbic acid the night and the subsequent morning after the procedure. | All participants given 50 to 125 mL/hr intravenous normal saline was started in all patients from randomization until at least 6 hours after the procedure. |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Alioglu, 2013 [6](#_ENREF_6) | Iomeprol | | IA | Not specified | 1 | Control | IV | IV infusion of 1 ml/kg/h with 0.45% saline for 24 h (12 h before and 12 h after exposure to contrast media, Prior to CM administration After CM administration |  |
|  |  | |  |  | 2 | NAC | Oral, IV lol | Acetylcysteine 600 mg twice a day, on the day before and on the day of cardiovascular procedure, Prior to CM administration After CM administration | All patients received IV infusion of 1 ml/kg/h with 0.45% saline for 24 h (12 h before and 12 h after exposure to contrast media |
| Allaqaband, 2002 [7](#_ENREF_7) | | LOCM | IA | Mean:  Arm1 1.47 ml/kg (SD 0.90),  Arm2 1.52ml./kg (SD 0.81),  Arm3 1.63ml/kg (SD 0.67),  Duration and volume not specified | 1 | 0.45% saline | IV | 0.45% Saline: 1 ml/kg/hr, 12 hour before procedure, during procedure, and 12 hrs after procedure, Prior , during CM, and after CM administration |  |
|  | |  |  |  | 2 | 0.45% saline + NAC | IV | Saline: 1 ml/kg/hr + NAC: 600mg 2x daily, Saline same as Arm 1, NAC: given 12 hrs before and 12 hrs after procedure, Prior to CM, during CM and after CM administration |  |
|  | |  |  |  | 3 | 0.45% saline + fenoldopam | IV | Saline: 1 ml/kg/hr + Fenoldopam: 0.1 microgram/kg/hr, Saline: same as Arm 1, Fenoldopam: starting 4 hrs before procedure and ending 4 hrs after, Prior to CM, during CM and after CM administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Amini, 2009[8](#_ENREF_8) | Iodixanol, Iohexol | IA | Not specified | 1 | Placebo | Oral | NR, 24hrs before and 24hrs after, Prior and After CM administration | The patients were hydrated orally and intravenously. All the patients were encouraged to drink fluids like water and fruit juice for at least 8 glasses over 12 h before the procedure and memorize the number of glasses. The oral preprocedural hydration was estimated by multiplying the number of glasses drunk by 200 ml  Patients were hydrated intravenously by 1 L of 0.9 normal saline, which was commenced in the catheterization laboratory |
|  |  |  |  | 2 | N-acetylcysteine | Oral | 600mg b.i.d, 24hrs before and 24hrs after, Prior and After CM administration |  |
| Aslanger, 2012 [9](#_ENREF_9) | Ioxaglate | IA | Not specified, Define, Mean: Arm1 - 204ml, Arm2 - 193ml, Arm3 - 205ml | 1 | Placebo | IV | 12ml saline during procedure, placebo capsules presumably twice daily for 2 days, 48 hrs, During CM administration After CM administration | 0.9% saline for 12 hrs at 1 ml/kg/hr |
|  |  |  |  | 2 | IV NAC | IV | 1200mg IV during procedure, 1200mg by mouth twice daily for 2 days, 48 hrs, During CM administration After CM administration |  |
|  |  |  |  | 3 | IA NAC | Other, IA | 600mg IA before procedure, 1200mg by mouth twice daily for 2 days, 48 hrs, Prior to CM administration After CM administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Awal, 2011[10](#_ENREF_10) | Not specified, | IA | Not specified | 1 | IVF Normal saline | IV | 1ml/kg 12hrs before and 12hrs after procedure, 12hrs before and 12hrs after procedure, Prior to CM administration After CM administration |  |
|  |  |  |  | 2 | IVF Normal saline+ N acetylcysteine | Oral, IV | 600mg NAC twice daily for 2 days plus control group treatment, Starting a day before procedure plus control group treatment, Prior to CM administration After CM administration |  |
| Azmus, 2005 [11](#_ENREF_11) | IA, | NR | Not specified | 1 | Placebo | Oral | 600mg, 72 hrs, Prior to CM administration During CM administration After CM administration | 2 doses prior to procedure, 2 doses day of procedure, 1 dose after procedure |
|  |  |  |  | 2 | NAC | Oral | 600mg, 72 hrs, Prior to CM administration During CM administration After CM administration | 2 doses prior to procedure, 2 doses day of procedure, 1 dose after procedure |
| Baker, 2003 [12](#_ENREF_12) | Iodixanol | IA | Not specified, Define, Mean: Arm1 222ml (SD 162), Arm2 238ml (SD 155) | 1 | Saline only | IV | Saline: 1ml/kg/h, 12 hrs pre-procedure and 12 hrs post-procedure, Prior to CM administration After CM administration |  |
|  |  |  |  | 2 | IV saline + NAC | IV | NAC: 150/mg/kg in 500ml saline, 4.5 hrs, Prior to CM administration After CM administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| BaraNSka-Kosakowska, 2007[14](#_ENREF_14) | LOCM | IA | Mean Volume:  Arm 1 :148+/- 58ml  Arm 2 :125+/-51ml | 1 | IV Normal Saline | IV | IV 500ml multielectrolyte fluid beforeprocedure and 500ml 0.9% saline with 20mg IV furosemide after the procedure |  |
|  |  |  |  | 2 | IV NAC + IV Normal Saline | IV | 300mg IV NAC before procedure +500ml multielectrolyte fluid before procedure. Then 500ml 0.9% saline with 20mg IV furosemide After procedure |  |
| Baskurt, 2009[13](#_ENREF_13) | LOCM, Ioversol | IA | Not specified | 1 | Hydration | IV | 1 ml /kg/ h for 12 h before and after contrast exposure, 12 h before and after contrast exposure, Prior to CM administration After CM administration |  |
|  |  |  |  | 2 | Hydration + N-acetylcysteine | Oral, IV | 1 ml /kg/ h of Isotonic Saline for 12 h before and after contrast exposure + NAC: 600 mg p.o. Twice daily the preceding day and the day of angiography, 12 h before and after contrast exposure, Prior to CM administration |  |
|  |  |  |  | 3 | Hydration + N-acetylcysteine + theophylline | Oral, IV | 1 ml /kg/ h of isotonic saline for 12 h before and after contrast exposure.NAC + theophylline (600 mg NAC p.o. And 200 mg theophylline p.o. Twice daily for the preceding day and the day of angiography, 12 h before and after contrast exposure, Prior to CM administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Beyazal, 2014[15](#_ENREF_15) | Iohexol | IV | 30-60 | 1 | 0.9% Normal Saline | IV | 3 ml/kg 0.9% normal saline 1 hour prior CM and 1ml/kh/hr for 6 hours post CM. Intervention given prior and after CM. |  |
|  |  |  |  | 2 | NaHCO3 + 5% dextrose | IV | 150 mEq NaHCO3 in 850ml 5% dextrose, at 3 ml/kg | 3 mL/kg for 1 hour before injection of iohexol. After the iohexol injection, 1 mL/kg/h of sodium bicarbonate solution was administered for 6 hours. |
|  |  |  |  | 3 | 0.9% Normal Saline + Diltiazem | Oral, IV | 3 ml/kg 0.9% normal saline 1 hour prior CM and 1ml/kh/hr for 6 hours post CM Diltiazem 2x60mg orally, one day prior CM and 2 days post CM | Diltiazem given at at 10:00 and at 22:00. |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Bilasy, 2012 [16](#_ENREF_16) | Iopamidol, LOCM | IA | 5 mL × body weight (kg)/SrCr level (mg/dL), Not specified | 1 | Placebo | IV | 100 ml sodium chloride (0.9%) 30 minutes before the procedure, 30 minutes before the procedure, Prior to CM administration | All patients received 0.9% sodium chloride (1 mL/kg per hour) for 24 hours beginning 12 hours before the procedure. The only exception to this were patients with left ventricular ejection fraction (LVEF) *<*40% or in NYHA III–IV class (New York Heart Association functional class III–IV), where hydration rate was reduced to 0.5 mL/Kg per hour. All patients got NAC 600mg bd for the day before and day of the procedure There is no usual care arm. All patients also got NAC. |
|  |  |  |  | 2 | Theophylline | IV | 200 mg of theophylline in 100 ml NaCl (0.9%) intravenously 30 minutes before CM administration., 30 minutes before the procedure, Prior to CM administration | All patients got NAC 600mg bd for two days |
| Boccalandro, 2003 [17](#_ENREF_17) | Iodixanol | IA | 2.3+/-1.5 mls/kg for control group and 2.3+/-1.7 for acetylcysteine group, Not specified, Define, 191+/-120 mls for control group and 192+/-142 for acetylcysteine group | 1 | No acetylcysteine+hydratrion | IV Other, Did not receive acetylcysteine | .45% hallf normal saline 75cc/hr, 12 hrs before and after, Prior to CM administration During CM administration | Both groups had a standardized intravenous hydration regimen with half-normal saline (0.45%) at 75 cc/hr for 12 hr before and after the proce- dure. |
|  |  |  |  | 2 | Acetylcysteine+hydration | Oral, IV | 600mg b.i.d acetylcysteine +.45% hallf normal saline 75cc/hr, day before and the day of the catheterization, Prior to CM administration During CM administration | .45% hallf normal saline 75cc/hr |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | | **Intervention: dose, duration temporal association to contrast** | | **Other intervention details** |
| Boscheri, 2007[18](#_ENREF_18) | Iodixanol | IA | Mean volume: 106 ml (SD 57) | 1 | Placebo + IV Normal Saline | | Oral, IV | | Oral placebo, given as 2 tablets 20 minutes prior to CM. | All participants given 500 ml IV normal saline 2 hours prior and 500 ml normal saline during angiography, and 500 ml normal saline 6 hours after. |
|  |  |  |  | 2 | Oral Ascorbic Acid + IV Normal Saline | | Oral, IV | | 1 g oral ascorbic acid, given as 2 tablets 20 minutes prior to CM. | All participants given 500 ml IV normal saline 2 hours prior and 500 ml normal saline during angiography, and 500 ml normal saline 6 hours after. |
| Boucek, 2013 [19](#_ENREF_19) | LOCM | IA or IV | Not specified, Define, Mean: 104ml for NaCl gorup, 115ml for NaHCO3 | 1 | Sodium chloride | | IV | | 154 ml of 8.4% NaHCO3 to 846 mls 5% glucose- 3 ml/kg x 1 hour, then 1 ml/kg/hr, 7 hrs, Prior to CM administration After CM administration |  |
|  |  |  |  | 2 | NaHCO3 | | IV | | 154 ml of 5.85% NaCl to 846 ml of 5% glucose-3 ml/kg x 1 hour, then 1 ml/kg/hr, 7 hrs, Prior to CM administration After CM administration |  |
| Brar, 2008[20](#_ENREF_20) | Ioxilan | IA | Not specified | 1 | NaCl | | IV | | 3ml/kg before and 1.5ml/kg/hr during and after, 1hr before, during and 4hrs after procedure. Prior, during and after cm administration |  |
|  |  |  |  | 2 | NaHCO3 | | IV | | 3ml/kg before and 1.5ml/kg/hr during and after, 1hr before, during and 4hrs after procedure. Prior, during and after cm administration |  |
| Briguori, 2002[21](#_ENREF_21) | Iopromide | IA | Not specified | 1 | Control | | NR | | Normal saline, NR, Prior to CM administration After CM administration | All patients received saline 0.45% 1ml/kg/h infusion 12 h before-12h after CM |
|  |  |  |  | 2 | Nac | | Oral | | NAC 600mg bid 2 days, 2 days, Prior to CM administration After CM administration | The day before and the day of the procedure |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Briguori, 2007[22](#_ENREF_22) | Iodixanol | IA | Dose and duration not specified. Mean volume: Arm 1: 179ml, Arm 2: 169ml, Arm 3: 169ml | 1 | IV Normal Saline + oral NAC | | Oral, IV | IV 0.9% saline, 1ml/kg/hr, 12 hours before and 12 horus after contrast media administration. NAC given at 1200mg twice daily the day before and day after procedure. | All patients given Arm 1 intervention. |
|  |  |  |  | 2 | IV NaHCO3 + oral NAC | | Oral, IV | 154mEq/L sodium bicarbonate in dextrose and water. Initial bolus 3ml/kg/hr given 1 hour before contrast media, 1ml/kg/hr during procedure and for 6 horus after. | All patients given Arm 1 intervention, along with sodium bicarbonate. |
|  |  |  |  | 3 | IV Normal Saline + IV ascorbic acid + oral NAC | | Oral, IV | 3g of ascorbic acid IV 2 horus before contrast media, and received 2g the night and morning after procedure. | All patients given Arm 1 intervention, along with ascorbic acid. |
| Brueck, 2013 [23](#_ENREF_23) | LOCM | IA | Not specified, Define, Median contrast volume was 110 mL (IQR, 80-160 mL) in the N-acetylcysteine group, 115 mL (IQR, 90-150 mL) in the ascorbic acid group, and 110 mL (IQR, 80-150 mL) in the placebo group | 1 | Placebo + IV Normal Saline | IV | | Placebo, over the course of 30 minutes, at 24 hrs and 1 hour before applying the contrast material, Prior to CM administration | All patients received 0.9% saline at a rate of 1.0 ml/kg body weight/hour by an infusion pump for 12 hrs prior to and after contrast media administration and continuing for 12 hrs afterward |
|  |  |  |  | 2 | NAC + IV Normal Saline | IV | | 600mg, over the course of 30 minutes, at 24 hrs and 1 hour before applying the contrast material, Prior to CM administration |  |
|  |  |  |  | 3 | Ascorbic Acid + IV Normal Saline | IV | | 500mg, over the course of 30 minutes, at 24 hrs and 1 hour before applying the contrast material, Prior to CM administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Burns, 2010 [24](#_ENREF_24) | Not specified | NR | Not specified | 1 | Placebo | IV | Placebo NR, 12 hrs prior to procedure and 12 hrs after, Prior to CM administration After CM administration | All patients received normal saline hydration |
|  |  |  |  | 2 | Nac | IV | 10 g NAC, 12 hrs prior to procedure and 12 hrs after, Prior to CM administration After CM administration | All patients received normal saline hydration |
| Buyukhatipoglu, 2010[25](#_ENREF_25) | Not specified | NR | Not specified | 1 | IV Normal Saline | IV | Usual care, IV Normal Saline |  |
|  |  |  |  | 2 | IV NAC + IV Normal Saline | IV | Usual care, IV Normal Saline + 600mg IV NAC | Only one dose given prior to procedure |
| Carbonell, 2007 [26](#_ENREF_26) | Iopromide | IA | Not specified | 1 | Placebo | IV Other, placebo | Saline IV for 30 min bid x4doses, 2days, Prior to CM administration After CM administration | Starting 6 hours before CM  Saline infusion 6h before-12h after |
|  |  |  |  | 2 | Nac | IV | NAC 600 mg IV for 30 min bid x4doses, 2days, Prior to CM administration After CM administration | Starting 6 hours before CM |
| Carbonell, 2010 [27](#_ENREF_27) | Iopromide | IA | Not specified | 1 | Placebo | IV | Placebo bid, 2 days, Prior to CM administration After CM administration | Saline 0.45% 1ml/kg/h infusion 6h before-12 after |
|  |  |  |  | 2 | Nac | IV | NAC 600mg bid, 30 min infusion bid - 2 days, Prior to CM administration After CM administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Castini, 2010[28](#_ENREF_28) | Iodixanol | IA | 320mg/ml | | 1 | IV normal saline | IV | 1 ml/kg isotonic saline body weight per hour for 12 hrs before and 12 hrs after administration of the contrast agent |  |
|  |  |  |  | | 2 | Oral NAC + IV normal saline | Oral | 600 mg twice daily, NAC, 12 hrs before and 12 hrs after administration of the contrast agent, prior and during CM administration plus IV saline regimen of Arm 1 | 1 ml/kg body weight per hour for 12 hrs before and 12 hrs after administration of the contrast agent |
|  |  |  |  | | 3 | IV NaHCO3 in 5% dextrose in water | IV | 154 ml of 1000 meq/L SB added to 846 ml of 5% dextrose in H2O. 3 ml/kg for 1 hour immediately before contrast injection. Thereafter, patients received the same fluid at a rate of 1 ml/kg per hour during contrast exposure and for 6 hrs after the procedure. Prior, during and after CM administration |  |
| Chousterman, 2013 [30](#_ENREF_30) | Iohexol | IA and IV | Not specified, Define, 100 mL (90-120) for NAC vs 90mL (80-120) for without NAC | | 1 | Saline | NR | 0.9% saline, Prior to CM administration After CM administration | All patients received saline 0.9% 24h infusion- 12 h before and 12 h after examination |
|  |  |  |  | | 2 | Nac | Oral | NAC 2400mg, 2 days, Prior to CM administration After CM administration | 37% of the patients received 600mg pre- 63% received 1200mg. All patients received 2400mg total |
| Chousterman, 2013[30](#_ENREF_30) | Iohexol | Either IA or IV | Median: 90ml in control, 100ml in NAC group | | 1 | No NAC | NR | Nr | All patients received 0.9% saline hydration for 12 hrs before and 12 hrs after procedure. |
|  |  |  |  | | 2 | Nac | Oral | 600mg, twice daily, 2400mg total. 48 hrs. Prior and after cm administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Demir, 2008 [31](#_ENREF_31) | Iomeprol, Iopamidol | IV | 100ml: Iomeprol (61.25 g/ml) Iopamidol (61.25 g/ml), Not specified, Define, 100ml: Iomeprol (61.25 g/ml) Iopamidol (61.25 g/ml) | 1 | Saline | IV | 2000ml 0.9% saline hydration, 48 hours (24 pre and 24 post), and after CM administration |  |
|  |  |  |  | 2 | Saline + NAC (NAC) | Oral | Hydration as arm 1 +  NAC 600 ml/d, 3 days prior, day of, 1 day post procedure |  |
|  |  |  |  | 3 | Saline + Misoprostol (M) | Oral | Hydration as arm 1 +  Misoprostol 400 mg/d (200mg, bid), 3 days prior, day of, 1 day post procedure |  |
|  |  |  |  | 4 | Saline + Theophylline (T) | Oral | Hydration as arm 1 +  Theophylline 200mg/d, 3 days prior, day of, 1 day post procedure |  |
|  |  |  |  | 5 | Saline + Nifedipine control (N) |  | Hydration as arm 1 +  Nifedipine 30 mg/day, 3 days prior, day of, 1 day post procedure |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Durham, 2002[32](#_ENREF_32) | Iohexol | IA | Mean: Arm1 48.1 min (SD 30.9), Arm2 44.8 min (SD 19.1), Define, Mean: Arm1 84.7 ml, Arm2 77.4 ml | 1 | IV hydration plus placebo | Oral | Saline 0.45% 1 ml/kg/h, placebo NR, 1h before and 3h after, Prior to CM administration After CM administration | Saline hydration given for 12 hrs before and and up to 12 hrs after procedure  All patients were placed on conventional iv hydration but actual rate and duration was left to physician |
|  |  |  |  | 2 | IV hydration plus NAC | Oral | Saline 0.45% 1 ml/kg/h, 1200mg NAC, 1h before and 3h after, Prior to CM administration After CM administration | Saline hydration given for 12 hrs before and and up to 12 hrs after procedure |
| Dvorsak, 2013[33](#_ENREF_33) | Iopamidol | IA | Mean Volume  Arm1: 130.6 ml  Arm2: 144.6 ml | 1 | IV Normal Saline + placebo | Oral, IV | Placebo given orally before procedure and after procedure in the evening and the next morning | All participants given 50-100ml/h IV normal saline for 2 hours before procedure and 6 hours after |
|  |  |  |  | 2 | IV Normal Saline + ascorbic acid | Oral, IV | 3 g ascorbic acid orally before procedure and 2 g after procedure in the evening and the next morning. | All participants given 50-100ml/h IV normal saline for 2 hours before procedure and 6 hours after |
| Erturk, 2014[34](#_ENREF_34) | Iopromide | IA | Not specified | 1 | IV normal saline | IV | Normal saline 1mg/kg/hr, 12 hr prior to and 12 hr after procedure, prior and after CM administration |  |
|  |  |  |  | 2 | Oral NAC + IV normal saline | Oral | Oral NAC 1200 mg (single dose), for twice daily for 24 hr prior to and 48 hr post procedure | Also received IV Normal saline 1mg/kg/hr, 12 hr prior to and 12 hr (Arm 1 regimen) |
|  |  |  |  | 3 | IV NAC + IV normal saline | IV | IV NAC 2400 mg pre/4800 mg post, within 1 hour prior to procedure and within 4-6 hours after the procedure | Also received IV Normal saline 1mg/kg/hr, 12 hr prior to and 12 hr (Arm 1 regimen) |
| Ferrario, 2009 [35](#_ENREF_35) | Iodixanol | IA | 250 mOsm/kg, Not specified | 1 | Placebo | Oral, IV | NR glucose placebo pills, 2 days, Prior to CM administration During CM administration | IV 0.9% saline given day before procedure and 24 hrs after procedure |
|  |  |  |  | 2 | Nac | Oral, IV | 600mg NAC twice a day, 2 days, Prior to CM administration During CM administration | IV 0.9% saline given day before procedure and 24 hrs after procedure |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Frank, 2003[36](#_ENREF_36) | Iomeprol | IA | mean dose was 80 mL; 3 CM injections into LCA and 2 injections into the RCA + biplane levocardiography using 25 mL | 1 | 0.9% saline volume expansion | IV | | 1000 ml 0.9% saline, 12 hrs. Prior and After CM administration | 6 hrs pre and 6 hrs post CM admin |
|  |  |  |  | 2 | 0.9% saline voume expansion + high-flux HD | IV + HD | | 1000 ml 0.9% saline (same as control)HD high flux started 10 min before CM and continued for 4 hrs during CM admin. |  |
| Fung, 2004 [37](#_ENREF_37) | Iopromide, LOCM, Other description, (iodine, 300 mg/mL; Ultavist; Shering Moldova, Berlin, Germany). Note that only iopromide was used. It is a LOCM, but was the ONLY one used | IA | (iodine, 300 mg/mL), Not specified, Define, Arm 1 mean 121.0 +/- 66.2 mL. Arm 2 mean=135.8 +/- 66.6 mL | 1 | IV hydration+ No drug | IV | Normal saline at 100 ml/h from 12 hrs before the procedure until 12 hrs after the procedure, unless the patient was in clinical heart failure, 24, Prior to CM administration During CM administration After CM administration | | Six patients in NAC and 7 patients in the control group could not complete the saline infusion regimen because of clinical heart failure |
|  |  |  |  | 2 | IV hydration +NAC | Oral, IV | Oral NAC 400 mg, thrice daily the day before and day of the contrast procedure+ normal saline ( at 100 ml/h from 12 hrs before the procedure until 12 hrs after the procedure, unless the patient was in clinical heart failure, NAC x 2 days and NS x 24 hrs, Prior to CM administration After CM administration Other, The NS was also given during CM administration | |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Goldenberg, 2004[38](#_ENREF_38) | Iopamidol | IA | Boluses of 8-15ml, Not specified, Define, boluses of 8-15ml | 1 | Placebo plus IV saline 0.45% | Oral | N/A, Prior to CM administration During CM administration After CM administration | All patients were treated with IV saline (0.45%) at a rate of 1 ml/kg of body weight per hour for 12 h before and 12 h after administration of the contrast agent.  All patients were treated with IV saline (0.45%) at a rate of 1 ml/kg of body weight per hour for 12 h before and 12 h after administration of the contrast agent. |
|  |  |  |  | 2 | Acetylcysteine plus IV saline 0.45% | Oral | 600mg thrice daily, 48hrs, Prior to CM administration During CM administration After CM administration | All patients were treated with IV saline (0.45%) at a rate of 1 ml/kg of body weight per hour for 12 h before and 12 h after administration of the contrast agent. |
| Gomes, 2005 [39](#_ENREF_39) | Ioxaglate | IA | Not specified, Define, 102.5 (SD 47.3) ml in NAC group; 102.8 (60.4) ml in placebo group | 1 | Placebo | Oral | Placebo, starting one day before the procedure (two doses before and two doses after the procedure, Prior to CM administration After CM administration | All patients received IV saline 0.9% 1 ml/kg/h from 12 hours before to 12 hours after exposure to the contrast medium  All patients received IV saline 0.9% 1 ml/kg/h from 12 hours before to 12 hours after exposure to the contrast medium |
|  |  |  |  | 2 | N-acetylcysteine | Oral | 600mg bid, starting one day before the procedure (two doses before and two doses after the procedure, Prior to CM administration After CM administration | All patients received IV saline 0.9% 1 ml/kg/h from 12 hours before to 12 hours after exposure to the contrast medium |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | | **Other intervention details** | |
| Gomes, 2012 [40](#_ENREF_40) | Ioxaglate | | IA | Not specified, Define, Mean: Arm1 125(SD 87), Arm2 124 (SD 65) | 1 | Saline solution | IV | | 0.9% saline solution- 3ml/kg/hr x one hour pre and 1ml/kg/hr x 6 hrs post, 7 hrs total, Prior to CM administration After CM administration | |  |
|  |  | |  |  | 2 | NaHCO3 | IV | | 154 meq/l NaHCO3 in 5% dextrose solution- 3ml/kg/hr x one hour pre and 1ml/kg/hr x 6 hrs post, 7 hrs total, Prior to CM administration After CM administration | |  |
| Gulel, 2005 [41](#_ENREF_41) | Ioxaglate | | IA | Not specified, Not specified | 1 | Control | NR | |  | | All patients received saline 1ml/kg/h infusion 12 h before-12 h after CM |
|  |  | |  |  | 2 | Nac | Oral | | 600mg bid, 2days, Prior to CM administration After CM administration | | The day before and the day of the day of CM |
| Gunebakmaz, 2012[42](#_ENREF_42) | Iopromide | | IA | 61-64, Not specified, Not specified | 1 | Saline | IV | | 1ml/kg/h, 18 hrs, staring 12 hrs before the procedure, Prior, during and after CM administration | |  |
|  |  | |  |  | 2 | Saline + Nebivolol | NR | | Hydration as arm 1 + Nebivolol 600mg bid, 4 days, starting 2 days before the procedure, Prior, during and after CM administration | |  |
|  |  | |  |  | 3 | Saline + NAC | IV | | Hydration as arm 1 + NAC 5mg day, 4 days, starting 2 days before the procedure, Prior, during and after CM administration | |  |
| Han, 2013[43](#_ENREF_43) | Iopamidol | | NR | NR | 1 | Low-dose Oral Atorvastatin + Oral Probucol | Oral | | Atorvastatin 20 mg before bedtime and probucol 250 mg 3 times a day, before procedure. | | Intervention information very limited with no mention of any hydration. (for all arms) |
|  |  | |  |  | 2 | High-dose Oral Atorvastatin + Oral Probucol | Oral | | Atorvastatin 40 mg at bedtime and probucol 250 mg 3 times a day, with loading dose of atorvastatin 40 mg and probucol 500mg 2 hours before procedure. | |  |
|  |  | |  |  | 3 | High-dose Oral Atorvastatin | Oral | | Atorvastatin 40 mg before bedtime, with loading dose atorvastatin 40 mg 2 hours before procedure. | |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Han, 2014[44](#_ENREF_44) | Iodixanol | IA | 320 mg iodine/ml | 1 | IV Normal Saline | IV | IV Isotonic saline (0.9% sodium chloride, 1 mL/kg/h) started 12 hours before and continued for 24 hours after contrast medium administration. | Statin therapy was resumed in both groups 3 days after contrast media administration, following completion of the study endpoints |
|  |  |  |  | 2 | Oral Rosuvastatin + IV Normal Saline | Oral, IV | Rosuvastatin 10 mg every evening from 2 days before to 3 days after contrast medium administration (total dose of 50 mg rosuvastatin over 5 days) | All participants given IV Isotonic saline (0.9% sodium chloride, 1 mL/kg/h) started 12 hours before and continued for 24 hours after contrast medium administration. |
| Heguilen, 2013 [45](#_ENREF_45) | Ioversal  LOCM | IA | NR | 2 | IV NaHCO3 in 5% dextrose in water | IV | 154 mmol NaHCO3, at 3ml/kg, 2 hours prior to CM administration and 1 ml/kg for 6-12 hours post CM administration. | NaHCO 3 group received 154 mEq/l of sodium bicarbonate in 5 % dextrose in H 2 O, mixed by adding 77 ml of 1,000 mEq/l sodium bicarbonate to 423 ml of 5 % dextrose in H 2 O |
|  |  |  |  | 3 | NAC + IV NaHCO3 in 5% dextrose in water | Oral, IV | 600mg NAC, twice daily., 2 days, Prior to CM administration During CM administration plus 154 mmol NaHCO3, at 3ml/kg, 2 hours prior to CM administration and 1 ml/kg for 6-12 hours post CM administration. |  |
|  |  |  |  | 4 | NAC + IV normal saline in 5% dextrose in water | Oral, IV | 600mg NAC plus 154 mmol NaCl solution at 3ml/kg/h, 2 days, Prior to CM administration During CM administration After CM administration | Saline solution given 2 hrs before procedure and 12 hrs after. NAC given in same schedule as Arm3 |
| Holscher, 2008[46](#_ENREF_46) | Iopromide | NR | Not specified | 1 | Hydration only | IV | 500 ml 5% glucose and 500 ml 0.9% NaCl, 12h before and 12 h after |  |
|  |  |  |  | 2 | Hydration plus dialysis | IV | Hydration same as arm 1 + dialysis | Low-flux HD started within 20 min after procedure. Duration: 2 hours |
|  |  |  |  | 3 | Hydration plus NAC | Oral, IV | Hydration same as arm 1 + NAC | NAC 600 mg x4 (2 doses before and 2 doses after) |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Hsu, 2007[47](#_ENREF_47) | Iohexol, LOCM, Other description, Omnipaque | IA | >1.5ml/kg, Not specified, Define, Mean+/- SD=188.6 +/- 57.9 ml | | 1 | Iv hydration + placebo | Oral, IV | IV 0.45% Saline at rate of 1ml/kg/hr + placebo pills 4 doses total, 2 before procedure and 2 after., 24hrs of IV fluid, 48 hrs of placebo pills, Prior to CM administration After CM administration | Placebo pills looked identical to that containing the NAC but was empty |
|  |  |  |  | | 2 | IV hydration + N-acetylcysteine | Oral, IV | Oral NAC 600mg twice a day. 2 doses before and 2 doses after procedure +IV 0.45% Saline at rate of 1ml/kg/hr 12 hrs before and 12 hrs after procedure, 48h, Prior to CM administration After CM administration |  |
| Hsu, 2012 [48](#_ENREF_48) | IohexolIopromide, Other description, Iobitridol | IV | Iohexol= 350 mgI/L, Iobitridol= 350 mgI/mL, Iopromide= 370 mgI/mL, Not specified | | 1 | Control | IV | 0.9% NaCl at 3ml/kg for 60 mins before CECT, then continued at 1 ml/kg/h during and for 6 hrs after procedure. Volume was reduced in patients with congestive pulmonary edema or heart failure, Prior to CM administration During CM administration After CM administration |  |
|  |  |  |  | | 2 | Nac | IV | 600 mg of NAC in 0.9% NaCl for 60 mins prior to contrast injection, Prior to CM administration |  |
| Izani Wan Mohamed, 2008[49](#_ENREF_49) | Iohexol | IA | Arm 1 mean (SD) = 126.67(94.37)ml  Arm 2 mean (SD)=136.73 (100.23)ml | | 1 |  | IV | Saline (0.45% NS) was given intravenously at a rate of I ml/kg/h 12 hrs before and after coronary angiogram Prior to CM administration After CM administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | | **Intervention** | **Administration** | | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Izani Wan Mohamed, 2008[49](#_ENREF_49) (continued) |  |  |  | | 2 |  | Oral, IV | | Oral NAC 600mg twice daily for four doses starting 12 hrs before procedure + Saline (0.45% NS) was given intravenously at a rate of I ml/kg/h 12 hrs before and after coronary angiogram Prior to CM administration After CM administration |  |
| Jaffery, 2012 [50](#_ENREF_50) | Iodixanol, IOCM | NR | Not specified,Define, High dose >300ml received by some. others received less than 300ml | | 1 | Hydration | IV | | Not specified, 24 hrs, Not stated, | Volumes infused comparable between groups |
|  |  |  |  | | 2 | Nac | IV | | 6g total-1200mg bolus then 200mg/hr for 24 hrs, 24 hrs, Not stated, | Saline0.9% infusion 1 ml/kg/hr for 24 hr. Patients with clinical evidence of heart failure (volume overload) received only intravenous NAC |
| Jo, 2008[51](#_ENREF_51) | IOCM | IA | 320mg iodine/ml | | 1 | Placebo | | Oral | NR, Prior and After CM administration on the same schedule as those receiving active treatment | All patients received intravenous half-isotonic saline at a rate of 1 mg/kg per hour for  12 hours before and 12 hours after coronary catheterization |
|  |  |  |  | | 2 | Simvastatin | | Oral | 40mg 12 hourly, 2 days. Prior and after cm administration |  |
| Jo, 2009[52](#_ENREF_52) | Iodixanol | IA | Mean volume:  Arm2: 203.6 ml  Arm2: 216.4 ml | | 2 | Oral NAC + IV 0.45% Saline | | Oral, IV | 1200mg oral NAC every 12 hours for 2 days. Total 4800mg NAC. | All participants received 0.45% saline at 1 ml/kg/h for 12 hours before and 12 hours after procedure. |
|  |  |  |  | | 3 | Oral Ascorbic acid + IV 0.45% Saline | | Oral, IV | 3g and 2 g oral ascorbic acid before procedure with 12 hour interval and twice with 2g per 12 hours after procedure. | All participants received 0.45% saline at 1 ml/kg/h for 12 hours before and 12 hours after procedure. |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | | **Intervention** | **Administration** | | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Jo, 2014[53](#_ENREF_53) | NR | IA | NR | | 2 | Regular Atorvastatin dose | | Oral | 10mg/day initiated day before PCI and maintained after. |  |
|  |  |  |  | | 3 | High Atorvastatin dose | | Oral | 80mg administered as early as possible before PCI, and maintained at 80mg/day for 5 days post procedure. Dose decreased to 10 mg/day after 5 days and maintained. |  |
| Kama, 2014[54](#_ENREF_54) | Iohexol | NR | All patients given < 100ml contrast | | 1 | IV Normal Saline | | IV | 1,000ml of 0.9% saline solution at 350ml/hour for 3 hours total, covering before, during and after procedure. |  |
|  |  |  |  | | 2 | IV NAC in Normal Saline | | IV | 150 mg/kg NAC in 1,000ml of 0.9% saline at 350m,l/hour for 3 hours total, covering before, during and after procedure. |  |
|  |  |  |  | | 3 | IV NaHCO3 in Normal Saline | | IV | 150 mEq in 1,000ml of 0.9% saline for 350ml/hour for 3 hours total, covering before, during and after procedure. |  |
| Katoh, 2014[55](#_ENREF_55) | Iopamidol | IA | Mean dose: 370 mg/ml (iodine)  Mean contrast volume: Arm1: 159ml, Arm2: 96ml | | 1 | No Right Atrium Hemodiafiltration | | IV | IV 0.9% saline, 1ml/kg/hour. Prior, during and after CM admin | IV saline started 12 hours before coronary procedure, continued for 24 hours |
|  |  |  |  | | 2 | Right Atrium Hemodiafiltration | | IV, Other: Right Atrium Hemodifiltration (RAHDF) | IV 0.9% saline, 1ml/kg/hour + hemodifiltration with blood suction from right atrium; Saline: 24 hours, RAHDF: 30 min before and contunied until 30min after procedure. Prior, during and after CM admin | IV saline started 12 hours before coronary procedure, continued for 24 hours |
| Kay, 2003[57](#_ENREF_57) | Iopamidol | IA | at the discretion of MD, Not specified, Not specified | | 1 | Placebo | | Oral | Placebo bid, 2 days, Prior to CM administration After CM administration | All pts received saline 0.9% 1ml/kg/h infusion 12h before-6 h after CM |
|  |  |  |  | | 2 | Nac | | Oral | NAC 600mg bid, 2 days, Prior to CM administration After CM administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | | **Dose, Duration, Volume** | **Arm** | | **Intervention** | | **Administration** | | **Intervention: dose, duration temporal association to contrast** | | **Other intervention details** | |
| Kaya, 2013[56](#_ENREF_56) | Iopromide | IA | | Mean Volume  Arm1: 147ml  Arm2: 158ml | | 2 | Oral Atorvastatin + IV Normal Saline | | | Oral, IV | | 80mg of oral atorvastatin before primary PCI. | All patients hydrated with IV normal saline for 12 hours after procedure. | |
|  |  |  | |  | | 3 | Oral Rosuvastatin + IV Normal Saline | | | Oral, IV | | 40 mg of rosuvastatin before primary PCI. | All patients hydrated with IV normal saline for 12 hours after procedure. | |
| Kefer, 2003 [58](#_ENREF_58) | Iohexol, Iopromide | NR | | Not specified, Not specified | | 1 | Placebo | | | IV | | Placebo NR, NR, Prior to CM administration After CM administration | Placebo given 12 hrs prior to procedure, and after procedure (time frame and dose not given) | |
|  |  |  | |  | | 2 | Nac | | | IV | | 2400mg, NR, Prior to CM administration After CM administration | 1200mg given 12 hrs prior to procedure, and 1200mg after procedure (time frame not given) | |
| Khalili, 2006 [59](#_ENREF_59) | Iohexol | NR | 647mg, Not specified, Define, 140ml | | 1 | | | Saline | | IV | 1000ml normal saline, NS, Prior to CM administration | | | Saline given at 1ml/kg/h |
|  |  |  |  | | 2 | | | NAC + saline | | IV | 1000ml normal saline + 1200mg NAC daily, 2 days, Prior to CM administration During CM administration | | | NAC given day prior to imaging and day of CM infusion |
| Kim, 2010[60](#_ENREF_60) | Iodixanol, Iopamidol, Other description, Iobitridol | IA | Define, 39+/-24min for treatment group and 46+/-30 for control group, Define, 201+/-144ml for treatment group and 216+/-166 for control group | | 1 | | | Control | | NR | Not stated | | | Physiological (0.9%) saline was given intravenously at a rate of 1 ml/kg of body weight per hour for 12 h before and 6 h after coronary angiography in both groups. |
|  |  |  |  | | 2 | | | Nac | | Oral | 600mg twice a day, 1200mg total, 48hrs, Prior to CM administration During CM administration | | |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | | **Administration** | **Intervention: dose, duration temporal association to contrast** | | **Other intervention details** |
| Kimmel, 2008[61](#_ENREF_61) | Iomeprol | IA | Not specified | 1 | Placebo | Oral | | NR, 48 hrs, Prior to CM administration During CM administration | Day before and day of procedure  All patients received a peri- procedural intravenous infusion (‘volume expansion’) of 1 ml/kg/h with 0.45% saline for 24 h (12 h before and 12 h after exposure to CM) | |
|  |  |  |  | 2 | Nac | Oral | | 600mg b.i.d, 48 hrs, Prior to CM administration During CM administration | Day before and day of procedure | |
|  |  |  |  | 3 | Zinc | Oral | | 60mg daily, 24 hrs, Prior to CM administration | Day before | |
| Kinbara, 2010[62](#_ENREF_62) | Iopamidol, | IA | 0.755g/ml | 1 | Hydration | IV | | 1ml/kg/hr, 30min before and 10hrs after angiography, prior and after CM administration | All arms given normal saline | |
|  |  |  |  | 2 | Hydration and aminophylline | IV | | 250mg +control treatment, 30min before+control treatment, Prior to CM administration |  | |
|  |  |  |  | 3 | Hydration and N-acetylcysteine | Oral | | 704mg twice daily+control treatment, day before and during procedure+control, prior and during CM administration |  | |
| Koc, 2012[63](#_ENREF_63) | Iohexol | IA | Mean Volume:  Arm1 130ml,  Arm2 130ml  Arm3 120ml | 1 | Standard NS | IV | | 0.9% saline 1 mL/kg/, 12 hours before and 12 hours after the coronary procedure |  | |
|  |  |  |  | 2 | IV NAC + High dose NS | IV | | IV bolus of 600 mg of NAC twice daily, before and on the day of the coronary procedure |  | |
|  |  |  |  | 3 | High dose NS | IV | | IV 0.9% saline 1 mL/kg/, before, on and after the day of coronary procedure |  | |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | | **Administration** | **Intervention: dose, duration temporal association to contrast** | | **Other intervention details** |
| Koc, 2013 [64](#_ENREF_64) | Not specified | IA | Median: Arm1 90ml, Arm2 90ml, Not specified | 1 | Normal saline | IV | | 1 ml.kg.hr 0.9% Saline, 24 hrs, Prior to CM administration After CM administration | 12 hrs before and 12 hrs after contrast | |
|  |  |  |  | 2 | NaHCO3 | IV | | 154ml of 1000 meq/l NaHCO3, 12 hrs, Prior to CM administration After CM administration | 6 hrs before and 6 hrs after contrast | |
| Kooiman, 2014[65](#_ENREF_65) | LOCM, Iodixanol  Iomeprol  Iobiditrol | IV | Mean dose (iodine): mean 35.5 -36.6 g; Mean volume: mean 104.7 - 105.7 mL | 1 | Normal saline | IV | | 2000 mL saline 0.9%, 1000 mL 1 h prior through1000mL 1 h after CM. Prior and After CM. | Duration 2 hours.All patients given normal saline hydration. | |
|  |  |  |  | 2 | IV Sodium Bicarbonate + normal saline | IV | | 250mL 1.4% bicarbonate, 1 hour prioir to CM. | 1h prior CT - NO Bicarbonate hydration post CM. All patients given normal saline hydration. | |
| Kotlyar, 2005[66](#_ENREF_66) | Iopromide, Other description, Ultravist-370, 0.769 mg/ml, 370mg iodine/ml; Schering Berlin, Germany | IA | Not specified, Define, mean 87ml in Arm 1, mean 89 ml in Arm 2 and mean 86ml in Arm 3 | 1 | IV hydration | | IV | 0.9% saline commenced at 200 ml/h 2 h before angiography and continued for a further 5 h after the procedure, NR, Prior to CM administration After CM administration | All patients, scheduled for angiography, received written instruction to drink 1 l of fluid the evening prior to the procedure | |
|  |  |  |  | 2 | NAC 300mg | | Oral | IV NAC 300mg +IV Hydration0.9% saline (Nacl at 200 ml/h 2 h before angiography and continued for a further 5 h after the procedure), NR, Prior to CM administration After CM administration | NAC was prepared in 100 ml of 5% dextrose and administered over 20 min, 1–2 h before angiography and again 2–4 h after angiography | |
|  |  |  |  | 3 | NAC 600mg | | Oral | IV NAC 600mg +IV hydration 0.9% saline (NaCl at 200 ml/h 2 h before angiography and continued for a further 5 h after the procedure), NR, Prior to CM administration After CM administration | NAC was prepared in 100 ml of 5% dextrose and administered over 20 min, 1–2 h before angiography and again 2–4 h after angiography | |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Kumar, 2014[67](#_ENREF_67) | Iohexol  Iodixanol | IA | Iohexol: 350 mg  Iodixanol: 320 mg | 1 | IV NS | IV | 1ml/kg/hr, 12 hours before and after administration of radio contrast agent |  |
|  |  |  |  | 2 | Oral NAC + IV NS | Oral, IV | 600 mg bd, 12 hours before and after administration of radio contrast agent |  |
|  |  |  |  | 3 | Allpurinol + IV NS | Oral, IV | 300 mg/day, 12 hours before and after administration of radio contrast agent |  |
| Lawlor, 2007[68](#_ENREF_68) | Not specified | Not specified | Dose: 100-200mg  Mean volume:  Arm 1:163ml  Arm 2:158  Arm 3: 165ml | 1 | Placebo + IV NS | Oral, IV | IV 0.9 NaCl 1 mL/kg/hr+ placebo(3 mL of 0.9% NaCl in 30 mL of ginger ale), 112 hr of IV hydration before and after | placebo given at same time as NAC was given to Arm 2 |
|  |  |  |  | 2 | IV hydration + oral NAC | Oral, IV | 600 mg NAC in 30 mL of ginger ale orally twice daily the day prior to and the day of angiography and 12 hr of IV hydration (0.9 NaCl 1 mL/kg/hr) both prior to and following the procedure, 48hours | Unlimited oral hydration was encouraged in the postprocedure  period in all groups |
|  |  |  |  | 3 | Oral hydration + oral NAC | IV | NAC (600 mg in 30 mL of ginger ale orally twice daily the day prior to and the day of angiography)+outpatient oral hydration preparation of 1,000 mL water in the 12 hr prior to the procedure + followed by IV hydration (0.9 NaCl 1 mL/kg/hr) beginning 1-2 hr prior to the procedure and continuing for a total of 6 hr afterward | Unlimited oral hydration was encouraged in the postprocedure  period in all groups |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Lee, 2011 [69](#_ENREF_69) | Iodixanol | IA | Not specified, Define, Mean: Arm1 120ml, Arm2 113ml | 1 | Saline | IV | 0.9% saline, 1 ml/kg/hour, 24 h infusion- 12 h before - 12 h after procedure, Prior to CM administration During CM administration After CM administration | All patients given 1200mg of NAC 2 times a day for 2 days |
|  |  |  |  | 2 | NaHCO3 | IV | 154 meq/L 3ml/kg/h before CM-1ml/kg/h after CM, 7 h infusion-1 h before -6 h after, Prior to CM administration During CM administration After CM administration |  |
| Lehnert, 1998 [70](#_ENREF_70) | Iopentol, | IA and IV | 3.0ml/kg(SD=0.4) for control and 3.5 ml/kg(SD=0.6) for the hemodialysis group, Not specified | 1 | Saline | IV | 0.9% saline at 83 ml/hour, 24 hours 12 h before contrast, and 12 hours after contrast | If the patient was not on a calcium channel blocker, then 10 mg nitrendipine per 12 hours was scheduled beginning 12 hours before catheterization |
|  |  |  |  | 2 | Hemodialysis | Other, Vascular accces shaldon catheter (femoral vein) | Hydrations as arm1  High flux hemodialysis at a flow 500 ml/min. for 3 hours started started 63+/- min after last bolus of CM | If the patient was not on a calcium channel blocker, then 10 mg nitrendipine per 12 hours was scheduled beginning 12 hours before catheterization. |
| Leoncini, 2014[71](#_ENREF_71) | Iodixanol | IA | Contrast Volume: Mean Arm 1: 138.2 ml, Mean Arm 2: 149.7ml | 1 | No rosuvastatin | Oral, IV | IV Saline 0.9% 1ml/kg/h 12h before-12h after + NAC 1200mg bid before and after CM |  |
|  |  |  |  | 2 | Rosuvastatin | Oral, IV | Rosuvastatin oral 40 mg at randomization + 20 mg/d for 2 days | Also given IV Saline 0.9% 1ml/kg/h 12h before-12h after + NAC 1200mg bid before and after CM (Arm1 intervention) |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Li, 2012 [72](#_ENREF_72) | Ultravist 370, iodine 370 mg/ml | NR | Not specified | 1 | Control | Oral, IV | Placebo 80 mg p.o before procedure; IV isotonic saline (0.9%) at a rate of 1 ml/kg/h before the procedure and for 12 h after the procedure, Prior to CM administration After CM administration | after procedure all patients had long term torvastatin treatment 40 mg/day. Iv isotonic saline (0.9%) at a rate of 1 ml/kg/h before the procedure and for 12 h after the procedure, prior to cm administration after cm administration |
|  |  |  |  | 2 | Atorvastatin | Oral, IV | Atorvastatin load 80 mg p.o before procedure, |  |
| Li, 2014[73](#_ENREF_73) | Iopamidol | IA | Not specified | 1 | Standard atorvastatin + probucol dose | Oral | Atorvastatin 20mg qn + Probucol 0.25mg tid, treatment A+P started 1-2 days before CM | All participants received IV normal saline 1ml/kg/h 6h before-6h after CM admin |
|  |  |  |  | 2 | Large atorvastatin + probucol dose | Oral | Atorvastatin 40mg qn + Probucol 0.25mg tid + loading dose 40 mg Atorvastatin/0.5mg Probucol 2 h prior CM, treatment A+P started 1-2 days before CM | All participants received IV normal saline 1ml/kg/h 6h before-6h after CM admin |
|  |  |  |  | 3 | Large atorvastatin dose | Oral | Atorvastatin 40mg qn + loading dose 40 mg atorvastatin, 2 h prior CM, treatment A started 1-2 days before CM | All participants received IV normal saline 1ml/kg/h 6h before-6h after CM admin |
| Liu, 2014[74](#_ENREF_74) | Iopamiron or Ultravist | IA | 133.36 | 2 | Risovustatin + IV saline | Oral | 10 mg 2-3 days pre and 2-3 days post procedure |  |
|  |  |  | 132.37 | 3 | Atorvastatin + IV saline | Oral | 20 mg 2-3 days pre and 2-3 days post procedure |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| MacNeill, 2003 [75](#_ENREF_75) | Iopromide, Ioxilan | IA | Not specified, Define, mean 110(sd=57.7)ml overall; 116 +/- 63.3 mL in placebo group and 103 +/- 52.0 in placebo group | 1 | Placebo | Oral, IV | Oral placebo (same schedule as in Arm 2) + IV 0.45% saline: 1. Pre-treatment: 1 ml/kg/hr x 12 hrs for inpatients and 2 ml/kg/hr x 4 hrs for day-case patients. Postprocedure: all patients were given 0.45% saline at 75 ml/hr x 12 hrs, oral placebo (same schedule as in Arm 2). IV saline: inpatients: total duration of 24 hrs. Day-case patients: 16 hrs total, Prior to CM administration After CM administration | All patients were pretreated with 0.45% saline at a rate of 1 ml/kg/hr for 12 hr for in-patients and 2 ml/kg/hr for 4 hr for day-case patients. See above regarding post-procedural fluids |
|  |  |  |  | 2 | Nac | Oral, IV | 600mg oral NAC at time of randomization, then 4 hrs later (pre-catherization), then 3 additional doses after the procedure at 12-hour intervals + control regimen of IVF, same IV schedule as control; NAC: as above (at least 4 hrs pre-procedure, then for at least 24 hrs post-procedure (after procedure, then 12 hrs later, then 12 hrs later), Prior to CM administration After CM administration |  |
| Manari, 2014[76](#_ENREF_76) | Iodixanol | IA | Not specified | 1 | IV normal saline | IV | 0.9% isotonic normal saline 1ml/kg/hr, 12 hours. | a ll patients received 70-100 IU/kg unfractionated heparin; aspirin at 162 mg or more; 300/600 loading dose of clopidogrel |
|  |  |  |  | 2 | High-dose infusion of IV normal saline | IV | 0.9% isotonic normal saline 3ml/kg/hr for 1 hour followed by normal saline 1 ml/kg/hr for 11 hours |  |
|  |  |  |  | 3 | IV standard bicarbonate | IV | NaCOH3 solution: 154mEq/L sodium bicarb 1 ml/kg/hr, 12 hours |  |
|  |  |  |  | 4 | High-dose IV bicarbonate | IV | NaCOH3 solution: 154mEq/L sodium bicarb 3 ml/kg/hr for 1 hr follwed by 1 ml/kg/hr for 11 hours |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Marenzi, 2003[77](#_ENREF_77) | Iopentol | IA | Not specified | 1 | Isotonic saline | IV | Saline 0.9% 1ml/kg/h for 24-32 hours (4-8 hours before-18-24 hours after) | Dose was 0.5 ml/kg/hr if ejection fration was less than 40% |
|  |  |  |  | 2 | Hemofiltration therapy | Continuous venovenous hemofiltration | Hydration as arm 1 + HF started 4-6 h before CM, stopped during procedure and resumed after completion, for 18-24 hours at a flow of 1000 ml/h | Participants received heparin at the start of and during the hemofiltration. |
| Marenzi, 2006 [78](#_ENREF_78) | Iohexol, LOCM, Other description, 350 mg of iodine per milliliter; Omnipaque, Amersham Health | NR | Define, Arm 1 mean 274;Arm 2mean= 264;Arm 3 mean= 253 | 1 | Placebo | NR |  | All treated patients and control patients underwent hydration with intravenous isotonic saline (0.9 percent) at a rate of 1 ml per kilogram of body weight per hour (or 0.5 ml per kilogram per hour in cases of overt heart failure) for 12 hrs |
|  |  |  |  | 2 | Standard dose NAC | Oral, IV | Total dose of 3000mg, Prior to CM administration After CM administration | Intravenous bolus of 600 mg of N-acetylcysteine before primary angioplasty and a 600-mg tablet orally twice daily for the 48 hrs after intervention |
|  |  |  |  | 3 | High dose NAC | IV | Total dose of 6000mg, Prior to CM administration After CM administration | Intravenous bolus of 1200 mg of N-acetylcysteine before intervention and 1200 mg orally twice daily for the 48 hrs after intervention |
| Marenzi, 2006[79](#_ENREF_79) | LOCM | Not specified | Not specified | 1 | Isotonic saline | IV | Saline 0.9% 1ml/kg/h for 24 hours (12 hours before-12 hours after) |  |
|  |  |  |  | 2 | Isotonic saline plus hemofiltration after contrast exposure | NR | Hydration as arm 1 + HF for 18-24 hours after CM at a flow of 1000 ml/h |  |
|  |  |  |  | 3 | Isotonic saline plus hemofiltration before and after contrast exposure | NR | Hydration as arm 1 + HF started 4-6 h before CM, stopped during procedure and resumed after completion, for 18-24 hours at a flow of 1000 ml/h |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Masuda, 2007[80](#_ENREF_80) | Not specified | Not specified | Not specified | 1 | NaCl | IV | 3ml/kg/hr before and 1ml/kg/hr during and after the procedure, 1hr, 6hrs, Prior, during and after CM administration | Only reports saline as NaCl |
|  |  |  |  | 2 | NaHCO3 | IV | 3ml/kg/hr before and 1ml/kg/hr during and after the procedure, 1hr, 6hrs, Prior, during and after CM administration | Only reports saline as NaCl |
| Matejka, 2010 [81](#_ENREF_81) | Iodixanol | IA | NS | 1 | Placebo | IV | IV infusion normal saline before CM - fluids 3days after CM, Prior to CM administration After CM administration | All pts had unrestricted oral fluids before and after the procedure |
|  |  |  |  | 2 | Theophylline | IV | 205.7mg, Theoph-1h infusion before CM in 500 ml normal saline- fluids 3days after CM, Prior to CM administration After CM administration |  |
| Merten, 2004[82](#_ENREF_82) | Iopamidol | NR | 796 mOsm/kgH2O, 755mgof iopamidol per milliliter, and 370 mg iodine per milliliter | 1 | NaCl | IV | 3ml/kg per hour for 1 hour before then 1ml/kg per hour during the contrast exposure and for 6 hrs after the procedure, Prior, during and after CM administration | 5% dextrose given in all arms |
|  |  |  |  | 2 | NaHCO3 | IV | 3ml/kg per hour for 1 hour before then 1ml/kg per hour during the contrast exposure and for 6 hrs after the procedure. Prior, during and after CM administration | 5% dextrose given in all arms |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | | **Intervention: dose, duration temporal association to contrast** | | **Other intervention details** |
| Miner,2004 [83](#_ENREF_83) | Iohexol | IA | Not specified, Define, Arm 1 mean=350ml; Arm 2 mean=344ml | 1 | Placebo | Oral | | NS, one dose every 12 hrs, 24 hrs, Prior to CM administration During CM administration | All patients received intravenous hydration with 0.45% saline at 75 ml/hour for at least 24 hrs beginning at the time of enrollment | |
|  |  |  |  | 2 | Nac | Oral | | 2000mg/dose x 2-3 doses. Total: 4000-6000mg, one dose every 12 hrs, 24 hrs, prior to cm administration during cm administration | Prior day patients received their first dose at 8 pm the night before their procedure with subsequent doses at 8 am and 8 pm the day of their procedure. Same day patients received their first dose at 8 am the day of their pci procedure with a subsequent dose at 8 pm the same day. Thus, if randomized to nac, prior day patients received a total of 6000 mg of nac while same day patients received a total of 4000 mg. | |
| Motohiro, 2011[84](#_ENREF_84) | Iopamidol, LOCM | IA | Not specified | 1 | Nacl | | IV | 1ml/kg/hr of NaCl, 12 hr before and after, Prior, during and after CM administration | Total infusion 24 h - 12h before/12 h after with saline | |
|  |  |  |  | 2 | Bicarbonate | | IV | 1ml/kg/h (154 meq), 9h - 3 h before-/ 6 h after, Prior, during and after CM administration |  | |
| Ochoa, 2004 [85](#_ENREF_85) | Iodixanol, Iohexol, Ioxaglate, Other description, diatrizoate | IA | 151 +/-71 mL(placebo group) and 136 +/-78 mL (NAC group), Not specified, Define, Arm 1 mean+/-SD=151 +/-71 mL and Arm 2=136 +/-78 mL | 1 | Placebo | | Oral | 5ml 0.9% saline diluted in 20 ml diet cola, 1 hr prior and 4 hr after, Prior to CM administration After CM administration | Saline IV 150 ml/h starting 4hr before and continuing 6 hr after procedure | |
|  |  |  |  | 2 | Nac | | Oral | 2 doses of NAC (1000 mg (5ml) in 20 ml diet cola, 1 hr prior and 4 hr after, Prior to CM administration After CM administration | Saline IV 150 ml/h starting 4hr before-and continuing 6 hr after procedure | |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Oldemeyer, 2003[86](#_ENREF_86) | Iopamidol | IA | Not specified, Define, Mean: Arm1 127ml (sd 73), Arm2 134ml (SD 71) | 1 | Placebo | Oral | Placebo in 120 ml bev every 12 h/ 4 doses, 2 days, Prior to CM administration After CM administration | Starting the night before CM  All pats received saline 0.45% 1ml/kl/h infusion 12h before-12h after CM |
|  |  |  |  | 2 | Nac | Oral | NAC 1500 mg diluted in 120ml bev - every 12 h/4 doses, 2 days, Prior to CM administration After CM administration | Starting the night before CM |
|  |  |  |  | 3 | Saline + NAC | Oral, IV | 1ml/kg/h + NAC 600 mg bid starting the day before CM, 12 h inf (6 h before -6 h after), Prior to CM administration During CM administration After CM administration |  |
| Ozcan, 2007[87](#_ENREF_87) | Ioxaglate  LOCM | IA | Median: 110 ml (25-300), Not specified, Define, comparable between groups | 1 | IV normal saline | IV | 1ml/kg/h, 12 h inf (6 h before -6 h after), Prior to CM administration During CM administration After CM administration | 154 meq |
|  |  |  |  | 2 | Oral NAC + IV normal saline | Oral, IV | 600mg oraly wice daily day before and day of procedure plus saline protocol in Arm 1 | 154meq |
|  |  |  |  | 3 | IV NaHCO3 in 5% dextrose in water | IV | 154 mL of 1000-mEq/L sodium bicarbonate to 846  mL of 5% dextrose in water  plus saline protocol in Arm 1 |  |
| Ozhan, 2010[88](#_ENREF_88) | Iopamidol | IA | Not specified, Define, comparable between groups | 1 | Nac | Oral | NAC 600 mg twice daily, day after procedure, 1 day, After CM administration | Saline 1000 ml infusion for 6 h after procedure |
|  |  |  |  | 2 | Nac + atorvastatin | Oral | NAC 600 mg and Atorvastatin 80 mg twice daily on day 1 after procedure. Atorvastatin 80mg d for 2 days after procedure, 3 days, After CM administration | Saline 1000 ml infusion for 6 h after procedure |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | | **Intervention** | **Administration** | | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Patti, 2011 [89](#_ENREF_89) | Iobitridol | IA | 915 mOsm/kg, Not specified, Define, Mean: Arm1 213ml (SD 13), Arm2 209ml (SD72) | 1 | | Placebo | Oral | | Placebo, not specified, first dose 12 hrs before and another dose 2 hrs before procedure, Prior to CM administration | All patients received 40mg/day of atorvastatin after PCI. |
|  |  |  |  | 2 | | Atorvastatin | Oral | | Total 120mg (80mg and 40mg doses), 80mg 12 hrs before procedure and 40mg 2 hrs before procedure, Prior to CM administration |  |
| Poletti, 2007[90](#_ENREF_90) | Iopromide | IV | 2 mL/kg body weight was used for nonneurologic indications, and a standard dose of 100 mL was used for brain imaging or suspicion of pulmonary embolism, | 1 | Hydration plus placebo | | IV | N/A, 1hr before and up to 12hrs after, Prior to CM administration After CM administration | | Each patient was assigned to receive 0.45% saline solution IV at a rate of 5 ml/kg body weight over the course of the hour before CT and followed at a rate of 1 ml/kg body weight for 12 hrs after CT.  Each patient was assigned to receive 0.45% saline solution IV at a rate of 5 ml/kg body weight over the course of the hour before CT and followed at a rate of 1 ml/kg body weight for 12 hrs after CT. |
|  |  |  |  | 2 | Hydration plu N-acetylcysteine | | IV | 900mg before and 900mg after, 1hr before and up to 12hrs after, Prior to CM administration After CM administration | | Each patient was assigned to receive 0.45% saline solution IV at a rate of 5 ml/kg body weight over the course of the hour before CT and followed at a rate of 1 ml/kg body weight for 12 hrs after CT. |
| Qiao, 2015[91](#_ENREF_91) | Iodixanol | IA | 212 ml | 1 | IV saline | | IV | (0.9% sodium chloride 1-1.5 ml/kg/hour for 3-12 hours before and 6-24 hours after the procedure). | |  |
|  |  |  | 204 ml | 2 | Rosuvastatin+IV saline | | Oral | 10 mg everyday for at least 48 hours before and 72 hours after CM administration. | | (0.9% sodium chloride 1-1.5 ml/kg/hour for 3-12 hours before and 6-24 hours after the procedure). |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Quintavalle,2012 [92](#_ENREF_92) | Iodixanol | IA | Not specified | 1 | | Control | NR | Only CKD prophylaxisis | All patients received CKD prophylaxisis : NAC 1200 mg orally twice daily the day before and day of administration of contast and NaHCO3 (154 meq/L in dextrose and H2O), 3 ml/kg/hr 1 hour before and 1 ml/kg/hr for 6 hrs after contrast |
|  |  |  |  | 2 | | Atorvastatin | Not reported, | 80mg, within 24 hrs of procedure, Prior to CM administration |  |
| Rashid, 2004[94](#_ENREF_94) | Iohexol | IA | 135.4 +/- 62.7 ml NAC group, 151.2 +/- 75.6 ml placebo group | 1 | | IV Normal Saline | IV | 500 ml saline infusion, twice | Both groups got 500 ml over 4-6 hrs before procedure and another 500 ml over 4-6 hrs after procedure |
|  |  |  |  | 2 | | IV Normal Saline + Oral NAC | Oral, IV | NAC 1 g per 500 ml saline infusion before and after CM | Both groups got 500 ml over 4-6 hrs before procedure and another 500 ml over 4-6 hrs after procedure |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Ratcliffe, 2009 [93](#_ENREF_93) | Iodixanol, IOCM | IA | Was not standardized due to variation among patients | 1 | | IV normal saline in 5%dextrose in water | IV | Normal saline (0.9% saline in 5% dextrose)  at an infusion rate of 3 ml/kg/h for 1 h before contrast, and continued at 1 ml/kg/h during the procedure and for 6 h following contrast exposure. |  |
|  |  |  |  | 2 | | IV and oral NAC + IV normal saline in 5% dextrose in water | Oral, IV | IV bolus of 1200 mg of NAC 1 h before intervention and 1200 mg orally twice daily for 48 h after intervention + IV NaCl (154 meq/L NaCl in 5% dextrose), at an infusion rate of 3 ml/kg/h for 1 h before contrast, and continued at 1 ml/kg/h during the procedure and for 6 h following contrast exposure, with normal saline as Arm 1 |  |
|  |  |  |  | 3 | IV NaHCO3 in 5% dextrose in water | | IV | IV NaHCO3 (154 ml of 1000 meq/L NaHCO3 to 846 ml of 5% dextrose, slightly diluting the dextrose concentration to 4.23%) at an infusion rate of 3 ml/kg/h for 1 h before contrast, and continued at 1 ml/kg/h during the procedure and for 6 h following contrast exposure.. |  |
|  |  |  |  | 4 | NaHCO3 plus NAC | | Oral, IV | IV bolus of 1200 mg of NAC 1 h before intervention and 1200 mg orally twice daily for 48 h after intervention + NaHCO3 (154 ml of 1000 meq/L NaHCO3 to 846 ml of 5% dextrose, slightly diluting the dextrose concentration to 4.23%) at an infusion rate of 3 ml/kg/h for 1 h before contrast, and continued at 1 ml/kg/h during the procedure and for 6 h following contrast exposure. |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Reinecke, 2007 [95](#_ENREF_95) | Iopromide, IOCM, Other description, (Ultravist 370TM, Schering AG, Berlin, Germany). | NR | Arm1:mean 188; Arm 2 mean184; Arm3 mean197mg/dl, Not specified | 1 | Hydration only | IV | | Glucose 5% + Saline 0.9% 24 h (2000 ml 12 h before- 12 h after CM |  |
|  |  |  |  | 2 | Hydration + dialysis | IV, Other, hemodialysis | | Hydration as arm 1 +  Low-flux HD started within 20 min after procedure. Duration: 2 hours |  |
|  |  |  |  | 3 | Hydration + NAC | Oral, IV | | Hydration as arm 1 + NAC 600 mg x4 (2 doses before and after) | One dose NAC 600 mg was given at the evening before catheterization, the second dose was given on the morning before catheterization; the third was given at the evening after catheterization and the last dose was given on the morning the day after angiography. |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | | **Intervention** | | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Sadat, 2011[96](#_ENREF_96) | Iopamidol | IA | Not specified | 1 | IV Hydration only | | IV | | 1 L iv infusion over a period of 12 hrs before angiography and 1 L over 12 hrs following the procedure)., 24 hrs, Prior to CM administration After CM administration | 12h before and 12h after |
|  |  |  |  | 2 | Hydration+NAC | | Oral | | Oral NAC 600 mg twice daily the day before the angiogram and 600 mg twice on the day of the angiogram along with iv fluids, 48 hrs, Prior to CM administration During CM administration After CM administration | Day before and day of procedure |
| Sandhu, 2006 [97](#_ENREF_97) | Iodixanol, Iopamidol | IA | Not specified, Define, 150.9 ml +/- 78.6 in NAC group, 125.4 +/- 67.4 ml in control group | 1 | Control | | Not reported | |  | They do not specify if NAC is oral , Hydration not part of protocol, left up to physician |
|  |  |  |  | 2 | Nac | | Not reported | | NAC 600mg bid, the day before and the day of the procedure, Prior to CM administration | They do not specify if NAC is oral , Hydration not part of protocol, left up to physician |
| Sanei, 2014[98](#_ENREF_98) | Iopromide | IA | 100 | 1 | Placbo | | Oral | | Placebo (2 tablets) from 24 hr before to 48 hr after CM administration | No information on other administrations |
|  |  |  |  | 2 | Atorvastatin | | Oral | | 80mg (2 40 mg tablets): from 24 hr before to 48 hr after CM administration |  |
| Sar, 2010[99](#_ENREF_99) | Iohexol | IV | Dose: 300mg/100ml | 1 | IV Normal Saline | | Oral, IV | | NaCl 0.9% 1ml/kg 12h prior-24 h after |  |
|  |  |  |  | 2 | Oral NAC + IV Normal Saline | | Oral, IV | | NAC 1200 mg/d, 1h prior CT and 2 d after for a total of 3 days, and NaCl 0.9% 1ml/kg 12h prior-24 h after |  |
| Seyon, 2007[100](#_ENREF_100) | Iohexol | IA | 147.5+/- 74.5 ml (tc); 133.68+/-58.04 (control) | 1 | Placebo+hydration | | Oral | | Placebo similar to NAC, once before procedure and then twice daily after for total of 4 doses. Prior and After CM administration | IV saline 0.45% 1 ml/kg/hr; 4-6 hrs pre and 12 hrs post |
|  |  |  |  | 2 | N-Acetylcysteine+hydration | | Oral | | 600mg, once before procedure and then twicw daily after for total of 4 doses. Prior and after cm administration | Iv saline 0.45% 1 ml/kg/hr; 4-6 hrs pre and 12 hrs post |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Shavit, 2009 [101](#_ENREF_101) | Iopamidol  LOCM | NR | | 755 mg iopamidol per milliliter, and 370 mg iodine per milliliter, Not specified | 1 | IV NaHCO3 in 5% dextrose in water | IV | | 154 mq/L NaHCO3 in 5% dextrose. The initial IV bolus was 3 ml/kg for 1 hour before cardiac catheterization. Following this bolus, patients received the same fluid at a rate of 1 ml/kg per hour during the contrast exposure and for 6 hrs after the procedure, . |  |
|  |  |  | |  | 2 | Oral NAC + intravenous normal saline | Oral, IV | | NAC 600 mg× 2/d PO the day before and the day of the procedure., 2d, Prior to CM administration plus sodium chloride at 1 ml/kg/hr for 12 hours prior to infusion |  |
| Shehata, 2015[102](#_ENREF_102) | Iopromide | IA | | In boluses of 15-20ml | 1 | Placbo | Oral | | Placebo formal matching Ator. | IV saline + N-acetylcysteine (1200 mg) |
|  |  |  | |  | 2 | Atorvastatin + IV saline | Oral | | (80 mg daily) for 48 h before PCI | IV saline + N-acetylcysteine (1200 mg) |
| Shyu, 2002 [104](#_ENREF_104) | Iopamidol  LOCM | NR | | 0.755mg/ml, Not specified | 1 | NAC + 0.45% saline | Oral, IV | | Placebo, placebo, Prior to CM administration After CM administration | Placebo + 0.45% saline, saline given 12 hrs before and 12 hrs after procedure |
|  |  |  | |  | 2 | 0 | Oral, IV | | 400mg, twice a day, 2 days, Prior to CM administration During CM administration After CM administration | NAC given orally day before procedure and day of procedure. 0.45% saline given by IV. Saline given 12 hrs before and 12 hrs after procedure |
| Spargias, 2004[103](#_ENREF_103) | IOCM, LOCM | IA | | Mean volume:  Arm1: 261 ml  Arm2: 287 ml | 1 | Placebo + IV Normal Saline | Oral, IV | | Oral placebo, given as 2 tablets2 hours before angiography and 2 g the night and morning after | All participants received IV Normal Saline rate of 50-125 ml/h from randomization until 6 hours after procedure. |
|  |  |  | |  | 2 | Oral Ascorbic Acid + IV Normal Saline | Oral, IV | | 3g oral ascorbic acid, given 2 hours before angiography and 2 g the night and morning after | All participants received IV Normal Saline rate of 50-125 ml/h from randomization until 6 hours after procedure. |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Tanaka, 2011[105](#_ENREF_105) | Iopamidol, LOCM | IA | 755mg/ml, range 205-216 +/- 80 | 1 | Placebo | Oral | 4 ml of water | Ringer lactate 1-2 ml/kg/h for 12 hr after pci  Volume of cm given per arm, comparable, dose not specified |
|  |  |  |  | 2 | Nac | Oral | 705 mg every 12 h/ total 2820, 36 hrs | Ringer lactate 1-2 ml/kg/h for 12 hr after pci |
| Tepel, 2000 [106](#_ENREF_106) | Iopromide | IV | 75 mL of .623g /mL with 300mg/mL iodine, Not specified, Define, • 75 mL of .623g /mL with 300mg/mL iodine | 1 | Not in PC Tables | IV | Placebo-N/A, Saline 1ml/kg 12 hrs before and 12 hrs after administration, 24 hrs, Prior to CM administration During CM administration After CM administration |  |
|  |  |  |  | 2 | Not n PC Tables | Oral, IV | Acetylcysteine 600mg orally twice daily before and on day of contrast administration, Saline 1ml/kg 12 hrs before and 12 hrs after administration, 2days, Prior to CM administration During CM administration After CM administration | Plus placebo |
|  |  |  |  | 3 | Not in PC Tables |  |  |  |
|  |  |  |  | 4 | Not in PC Tables |  |  |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Thayssen, 2014[107](#_ENREF_107) | Iodixanol (given to “almost all patients”, no further details) | IA | Duration: mean 19 minutes  Volume: mean 130-150 ml | 1 | IV Normal Saline | IV | IV 0.9% isotonic saline given ≥60ml/h for minimum 6 hours. |  |
|  |  |  |  | 2 | IV Normal Saline + oral NAC | Oral, IV | NAC 1200 mg/d (1200 mg before and 1200mg/d for 48h). Prior and after CM administration | All patients received IV 0.9% isotonic saline given ≥60ml/h for minimum 6 hours (from Arm1) |
|  |  |  |  | 3 | IV Normal Saline + IV NaHCO3 | IV | NaHCO3 500ml/1h then 100ml/h for 5 hours Prior, during, and after CM administration | All patients received IV 0.9% isotonic saline given ≥60ml/h for minimum 6 hours (from Arm1) |
|  |  |  |  | 4 | IV Normal Saline + oral NAC + IV NaHCO3 | Oral, IV | NAC 1200 mg/d (1200 mg before and 1200mg/d for 48h), plus NaHCO3 500ml/1h then 100ml/h for 5 hours. Prior, during, and after CM administration | All patients received IV 0.9% isotonic saline given ≥60ml/h for minimum 6 hours (from Arm1) |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Thiele, 2010[108](#_ENREF_108) | Iopromide | IA | Not specified, Define, median=180 ml | 1 | Placebo | IV | 10ml of NaCl 0.9% before angio, 10 mls twice daily for 48h after PCI, 48 hrs, Prior to CM administration After CM administration | After PCI, all treated and control patients underwent hydration with intravenous NaCl (0.9%) infusion at a rate of 1ml/kg of body weight per h for 12 h (or 0.5ml/kg/h in overt heart failure) |
|  |  |  |  | 2 | Nac | IV | 1,200mg twice daily, 6000mg, 48 hrs, Prior to CM administration After CM administration | IV bolus of 1,200 mg before angioplasty and 1,200 mg intravenously twice daily for the 48 h after PCI (total dose 6,000 mg |
| Toso, 2010[109](#_ENREF_109) | Iodixanol | IA | Not specified | 1 | Placebo | Oral | Placebo NR, 4 days - starting 48 h before CM-48 h after, Prior to CM administration After CM administration | Saline 1ml/kg/h infusion 12h before CM-12 after + NAC VO 1200mg bid 1 day before CM and day after |
|  |  |  |  | 2 | Atorvastatin | Oral | Atorvastatin 80mg/d, 4 days - starting 48 h before CM-48 h after, Prior to CM administration After CM administration | Saline 1ml/kg/h infusion 12h before CM-12 after + NAC VO 1200mg bid 1 day before CM and day after |
| Traub, 2013[110](#_ENREF_110) | Iodixanol, Iopamidol, Ioversol | IV | Not specified | 1 | IV Normal Saline | IV | 500ml normal saline 30min infusion pre CM then infusion 67ml/h), a min 2.5 hours, prior, during and after CM admin | Postcontrast infusion was stopped when one of the following occurred: the patient was discharged, the post-CT infusion was stopped at the discretion of the clinical team caring for the patient, the patient was discharged from the hospital, or 24 hours elapsed, symptomatic hypotension requiring treatment,  altered mental status, respiratory distress, pulmonary edema,  oropharyngeal edema or bronchospasm requiring treatment, severe urticaria or patient discomfort |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Traub, 2013[110](#_ENREF_110) (continued) |  |  |  | 2 | IV NAC + IV Normal Saline | | IV | NAC 3g in 500ml normal saline 30min infusion pre CM then infusion 200mg/h (3g in 1000ml at 67ml/h), a min 2.5 hours, prior, during and after CM admin |  |
| Ueda, 2011[111](#_ENREF_111) | Iohexol, Iopamidol, | IA | Not specified | 1 | NaCl | | IV | 0.5 ml/Kg bolus, Prior, during and after CM administration | Followed by infusion at 1ml/kg/h for 6 hr  Volumes were comparable. Given at the discretion of MD |
|  |  |  |  | 2 | NaHCO3 | | IV | 154 meq/L bolus, Prior, during and after CM administration |  |
| Vasheghani-Farahani, 2010 [112](#_ENREF_112) | Iohexol | IA | Not specified, Define, 123 arm 1- 112 arm 2 | 1 | Saline | | IV | Saline 0.45% - 1075ml, 7h infusion (1 h prior- 6h after), Prior to CM administration During CM administration After CM administration | Infusion- 3ml/kg/h prior CM then 1ml/kg/h |
|  |  |  |  | 2 | Bicarbonate | | IV | Saline 0.45% 1000ml + 75ml 8.4% bicarbonate, 7h infusion (1 h prior- 6h after), Prior to CM administration During CM administration After CM administration | Infusion- 3ml/kg/h prior CM then 1ml/kg/h |
| Vogt, 2001[113](#_ENREF_113) | LOCM | Not specified | Not specified | 1 | IV saline | | IV | 1 ml/kg/hr, 24 hrs (12 hrs before and after contrast administration) |  |
|  |  |  |  | 2 | IV saline/Hemodialysis | | IV, hemodialysis | Hydration as arm 1 + High-flux HD started between 30 and 280 min after first bolus of CM  Duration: 3 hours | Hd: high-flux polysulphone membrane (f50 or f60)). The mean blood flow was 180 |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Wang, 2008[114](#_ENREF_114) | Iopromide | IA | Mean Volume: 103.48ml control group, 82.13ml NAC group | 1 | IV Normal Saline | IV | Normal saline hydration, during procedure and 10 hours after |  |
|  |  |  |  | 2 | IV NAC + IV Normal Saline | Oral | 5g NAC + normal saline hydration, during procedure and 10 hours after |  |
| Webb, 2004 [115](#_ENREF_115) | Other description, Ioversol | IA | Not specified, Define, Median 120 ml in both groups | 1 | Placebo | IV | 50ml of 5% dextrose saline, 15 minutes, Prior to CM administration | Placebo  Study solution was administered within 15 minutes 1 hrs prior to contrast procedure.  According to abstract but not in text, all patients received 200 ml NS prior to procedure and 1.5 ml/kg/h for 6 hr after procedure |
|  |  |  |  | 2 | Nac | IV | 50ml of 5% dextrose saline + 500mg NAC, 15 minutes, Prior to CM administration | NAC mixed into saline and given intravenously |
| XinWei, 2009[116](#_ENREF_116) | Iodixanol (in patients with CKD)  Iohexol (all other patients) | IA | Body weight (kg) x 5ml/SrCr. | 1 | Simvastatin 20 | Oral | 20mg/day from admission to the day before PCI, and then resumed simvastatin 20 mg/day for the following days, Up to 48hrs after procedure. Prior and After CM administration | All patients were hydrated with intravenous isotonic saline (0.9%) at a rate of 1 ml/kg body weight per hour for 6 to 12 hrs before and 12 hrs after coronary catheterization to achieve a urinary flow rate of ≥150 ml/hour within 6 hours after PCI. |
|  |  |  |  | 2 | Simvastatin 80 | Oral | 80mg/day from admission to the day before PCI, and then resumed simvastatin 20 mg/day for the following days. Up to 48hrs after procedure. Prior and After CM administration |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Yeganehkhah, 2014[117](#_ENREF_117) | Iohexol | IA | Average dose:  Arm 1: 41.9ml  Arm 2: 45.7 ml  Arm 3: 45.1ml | 1 | IV NS | IV | 3 mL/kg/ 1218 Yeganehkhah MR, Iranirad L, Dorri F, et al hour of Na bicarbonate, an hour prior to angiography and 1 mL/kg/hour, within six hours after angiography. |  |
|  |  |  |  | 2 | NaHCO3 + IV NS | IV | oral NAC (600 mg twice a day) one day before angiography and on the day of angiography, in addition to isotonic normal saline (1 mL/kg/hour; maximum 100 mL/hour) for 12 hours before and after angiography. |  |
|  |  |  |  | 3 | Oral NAC + IV NS | Oral, IV | isotonic normal saline (1 mL/kg/hour; maximum 100 mL/hour) was prescribed for 12 hours, before and after angiography. |  |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Yun, 2014[118](#_ENREF_118) | Iodixanol  Iohexol  (not analyses seperately) | IA | Arm 1: 226 ml  Arm 2: 216ml | 1 | IV normal saline | IV | (0.9% sodium chloride, 1 mL/kg/h) was per­formed during the pre- and post-PCI periods at the physician’s dis­cretion. Hydration rate was reduced to 0.5 mL/kg/h for patients with a left ventricular ejection fraction (EF) <40%. | All patients received: Aspirin (300 mg/day) and clopidogrel (300 mg/day) were loaded in all patients before the procedure. An intravenous bolus of 5000 U unfractionated heparin was given, and additional heparin boluses were given to maintain activated clotting time >300 seconds dur­ing the procedure. Coronary angiography and stent implantation were performed using standard interventional techniques. Platelet glycoprotein IIb/IIIa inhibitors were administered according to op­erator preference. Aspirin (100 mg/day), clopidogrel (75 mg/day), and statins were prescribed to all patients after the procedure. |
|  |  |  |  | 2 | Risovustatin + IV normal saline | Oral | 40 mg  Plus hydration:  (0.9% sodium chloride, 1 mL/kg/h) was per­formed during the pre- and post-PCI periods at the physician’s dis­cretion. Hydration rate was reduced to 0.5 mL/kg/h for patients with a left ventricular ejection fraction (EF) <40%. |  |
| Zhang, 2015[119](#_ENREF_119) | Iodixanol  (moderate contrast volume) | IA | 200–300ml | 1 | Placebo | Oral | Blank control 2 days before to 3 days after contrast medium administration. | Hydration administered at the physician’s discretion |
|  |  |  |  | 2 | Rosuvastatin | Oral | 10 mg 2 days before to 3 days after contrast medium administration. | Hydration administered at the physician’s discretion |
| Zhang, 2015[119](#_ENREF_119) | Iodixanol  (high contrast volume) | IA | >300ml | 1 | Placebo | Oral | Blank control 2 days before to 3 days after contrast medium administration. | Hydration administered at the physician’s discretion |
|  |  |  |  | 2 | Rosuvastatin | Oral | 10 mg 2 days before to 3 days after contrast medium administration. | Hydration administered at the physician’s discretion |

**Evidence Table E-3. Interventions for studies comparing interventions to prevent development of CIN (continued)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author, year** | **Contrast Medium** | **Contrast Administration** | **Dose, Duration, Volume** | **Arm** | **Intervention** | **Administration** | **Intervention: dose, duration temporal association to contrast** | **Other intervention details** |
| Zhou, 2012[120](#_ENREF_120) | Iodixanol, Iopromide, Iohexol | IA | Mean volume:  Arm1: 133.7 ml  Arm2: 136.4 ml | 1 | IV Normal Saline | IV | IV Normal Saline at 1mg/kg/h for 4 hours before and at least 12 hours after procedure. |  |
|  |  |  |  | 2 | IV and Oral Ascorbic Acid + IV Normal Saline | Oral, IV | 3g ascorbic acid IV injection before procedure, then oral 0.5 g ascorbic acid every 12 hours for 2 days after procedure. Total 5 g administered IV and Oral | All participants given IV Normal Saline at 1mg/kg/h for 4 hours before and at least 12 hours after procedure. |

ACEI= Angiotensin Converting Enzyme Inhibitor, ANP=Atrial Natriuretic Peptide, AVH= Amlodipine Valsartan Hydration, b.i.d=Bi-daily, Bev=Beverage, CAG=Coronary Angiogram, Cc/hr= cubic centimeter per kilogram, CECT=Contrast Enhanced Computed Tomography, CM=Contrast Media, H=Hour, HD=Hemodialysis, hrs=hrs, IA=Intrarterial, IOCM=Iso-Osmolar Contrast Media, IQR=Interquartile Range, IV=Intravenous, IVF=Intrvenous Fluid, LCA=Left Coronary Artery, LOCM=Low-Osmolar Contrast Media, Mcg/kg/min=microgram per kilogram per min, MD= Doctor of Medicine, mEq/l= milliequivalents per liter, Mg/dl=milligram per deciliter, Mg/kg/hour=milligram per kilogram per hour, Mg/kg=milligram per kilogram, Mg=milligram, mls=milliliters, mOsm/kg= milliosmoles per kilogram, N/A=Not Applicable, NAC=N-acetylcysteine, NaCl=Sodium Chloride, NaHCO3=Sodium Bicarbonate, NR=Not Reported, NS=Normal Saline, Osm=Omsolarity, p.o.=By Mouth, PCI=Percutaneous Coronary Intervention, PCWP=Pulmonary Capillary Wedge Pressure, POBID=By mouth twice daily, RCA=Right Coronary Artery, SB=Sodium Bicarbonate, SD=Standard Deviation, Ug/kg/min=microgram per kilogram per minute, VO=Vocal Order